United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Minnesota Agricultural
Experiment Station

Soil Survey of Becker County, Minnesota

Part I

This page intentionally left blank.

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, which is the color map preceding the detailed soil maps, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in November 1992. Soil names and descriptions were approved in February 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This survey was made cooperatively by the Natural Resources Conservation Service and the Minnesota Agricultural Experiment Station. Assistance was provided by the Agricultural Extension Service, the Minnesota Department of Natural Resources, and the Soil and Water Conservation Board. The survey was partially funded by the Legislative Commission for Minnesota Resources and by Becker County. It is part of the technical assistance furnished to the Becker County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of Formdale-Langhei-Flom soils.

Contents

Part I

Index to series iv
Index to map units v
Summary of tables ix
Foreword xi
How this survey was made 1
Survey procedures 2
General nature of the survey area 3
History 3
Logging history 4
Transportation facilities 4
Physiography and relief 5
Drainage 5
Geologic history 5
Water supply 6
Climate 6
General soil map units 9
Formation and classification of the soils 19
Soil series and detailed soil map units 29
References 171
Glossary 173

Part II (For page numbers, see Contents in Part II)

Detailed soil map unit legend
Summary of tables
Agronomy
Crops and pasture
Crop yield estimates
Land capability classification
Prime farmland
Erosion factors
Windbreaks and environmental plantings
Forest land
Recreation
Wildlife habitat
Engineering
Building site development
Sanitary facilities
Waste management
Construction materials
Water management
Soil properties
Engineering index properties
Physical and chemical properties
Water features
Soil features
References
Glossary

Issued 1998

Index to Series

Aazdahl series 30
Abbeylake series 31
Arvilla series 33
Audubon series 34
Auganaush series 37
Balmlake series 38
Barnes series 40
Beltrami series 42
Birchlake series 43
Blowers series 45
Bootlake series 46
Boyerlake series 50
Buse series 50
Bygland series 51
Cathro series 52
Chapett series 54
Colvin series 56
Corliss series 57
Dalbo series 58
Darnen series 61
Dorset series 62
Dovray series 64
Eagleview series 65
Egeland series 70
Egglake series 72
Epoufette series 74
Flom series 75
Forada series 76
Fordville series 77
Forman series 78
Formdale series 80
Foxlake series 84
Friendship series 85
Gonvick series 86
Graycalm series 87
Hamerly series 89
Hamre series 92
Hangaard series 93
Haslie series 94
Hillview series 96
Karlstad series 97
Lakepark series 98
Lamoure series 99
Langhei series 100
Lida series 102
Lindaas series 104
Lupton series 105
McIntosh series 106
Meehan series 107
Menahga series 108
Mooselake series 108
Naytahwaush series 115
Nebish series 117
Nidaros series 121
Nymore series 122
Osakis series 124
Oylen series 125
Paddock series 126
Quam series 128
Rifle series 129
Rockwell series 130
Rockwood series 131
Rosy series 133
Runeberg series 134
Rushlake series 135
Sandberg series 136
Sedgeville series 137
Seelyeville series 138
Smiley series 139
Snellman series 141
Sol series 144
Sugarbush series 148
Sverdrup series 151
Sybil series 152
Two Inlets series 155
Urness series 157
Vallers series 158
Verndale series 159
Waukon series 162
Winger series 165
Wolverton series 167
Wykeham series 168
Wyndmere series 169

Index to Map Units

20B—Chapett fine sandy loam, 2 to 8 percent slopes. 54
20C2—Chapett fine sandy loam, 8 to 15 percent slopes, eroded 55
20E—Chapett fine sandy loam, 15 to 30 percent slopes. 55
26—Aazdahl clay loam 31
33B—Barnes loam, 2 to 6 percent slopes 40
36—Flom silty clay loam. 75
38B—Waukon loam, 2 to 8 percent slopes 162
38C—Waukon loam, 8 to 15 percent slopes 163
38E—Waukon loam, 15 to 30 percent slopes 163
40B—Nebish loam, 2 to 8 percent slopes 118
40C—Nebish loam, 8 to 15 percent slopes 118
40E—Nebish loam, 15 to 30 percent slopes 119
47—Colvin silty clay loam. 56
63—Rockwell loam. 131
108—McIntosh silt loam 107
111—Hangaard sandy loam. 93
121—Wykeham fine sandy loam. 168
125—Beltrami loam 43
133A—Dalbo silt loam, 0 to 2 percent slopes 59
133B—Dalbo silt loam, 2 to 8 percent slopes 60
133C—Dalbo silt loam, 8 to 15 percent slopes 60
133E—Dalbo silt loam, 15 to 30 percent slopes 60
137—Dovray silty clay. 65
141B—Egeland fine sandy loam, 1 to 6 percent slopes. 71
141C—Egeland fine sandy loam, 6 to 12 percent slopes. 72
168B—Forman clay loam, 2 to 6 percent slopes 79
168C2—Forman clay loam, 6 to 12 percent slopes, eroded 79
168D2—Forman clay loam, 12 to 20 percent slopes, eroded 80
168E—Forman clay loam, 20 to 30 percent slopes. 80
171B—Formdale clay loam, 2 to 5 percent slopes. 81
180—Gonvick loam 86
184—Hamerly loam 90
191—Epoufette sandy loam 74
202—Meehan loamy sand 108
207D—Nymore loamy sand, 12 to 20 percent slopes 123
267B—Snellman sandy loam, 2 to 8 percent slopes 141
267C—Snellman sandy loam, 8 to 15 percent slopes 142
267E—Snellman sandy loam, 15 to 30 percent slopes 142
315A—Bootlake sandy loam, 0 to 2 percent slopes. 47
315B—Bootlake sandy loam, 2 to 5 percent slopes. 48
332B—Sugarbush sandy loam, 1 to 8 percent slopes 148
335—Urness mucky silt loam 157
339—Fordville loam 78
344—Quam silty clay loam. 128
351—Colvin silty clay loam, depressional. 57
375—Forada loam 76
398—Winger silty clay loam, depressional. 165
406A—Dorset sandy loam, 0 to 2 percent slopes. . . . 62
406B—Dorset sandy loam, 2 to 6 percent slopes. . . . 63
413—Osakis sandy loam 124
418—Lamoure silty clay loam, occasionally flooded. 99
422B—Bygland silty clay loam, 1 to 6 percent slopes. 51
422C—Bygland silty clay loam, 6 to 15 percent slopes. 52
503B—Balmlake fine sandy loam, 1 to 8 percent slopes. 39
503C—Balmlake fine sandy loam, 8 to 15 percent slopes 39
503E—Balmlake fine sandy loam, 15 to 30 percent slopes 40
508—Wyndmere fine sandy loam. 170
540—Seelyeville muck 139
541—Rifle mucky peat 130
544—Cathro muck 53
564—Friendship loamy sand 85

567A—Verndale sandy loam, 0 to 2 percent slopes 160
567B—Verndale sandy loam, 2 to 6 percent slopes 160
579C2—Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded 81
624—Rosy sandy loam 134
701—Runeberg mucky loam, depressional 135
711B—Arvilla-Sandberg complex, 2 to 6 percent slopes 33
711C—Arvilla-Sandberg complex, 6 to 12 percent slopes 34
718B—Naytahwaush loam, 2 to 8 percent slopes .. 116
718C—Naytahwaush loam, 8 to 15 percent slopes 117
718E—Naytahwaush loam, 15 to 30 percent slopes 117
721E—Corliss loamy sand, 20 to 35 percent slopes 57
746—Haslie muck 94
747B—Audubon silty clay loam, 0 to 6 percent slopes 35
753D—Abbeylake loamy sand, 12 to 20 percent slopes 31
753E—Abbeylake loamy sand, 20 to 30 percent slopes 32
765—Smiley loam 140
767—Auganaush loam 38
775B—Sugarbush-Two Inlets complex, 1 to 8 percent slopes 149
775C—Sugarbush-Two Inlets complex, 8 to 15 percent slopes 149
776B—Snellman-Sugarbush complex, 2 to 8 percent slopes 143
776C—Snellman-Sugarbush complex, 8 to 15 percent slopes 143
776E—Snellman-Sugarbush complex, 15 to 30 percent slopes 144
778B—Dorset-Corliss complex, 1 to 6 percent slopes 63
778C—Dorset-Corliss complex, 6 to 12 percent slopes 64
780B—Audubon-Boyerlake complex, 1 to 6 percent slopes 35
780C2—Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded 36
780D2—Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded 36
785—Hamerly-Winger complex 90
786—Winger-Hamerly-Colvin complex 166
797—Mooselake and Lupton soils 115
867B—Graycalm-Menahga complex, 1 to 8 percent slopes 87
867C—Graycalm-Menahga complex, 8 to 15 percent slopes 88
867E—Graycalm-Menahga complex, 15 to 30 percent slopes 88
903B—Barnes-Langhei complex, 2 to 6 percent slopes 41
903C2—Barnes-Langhei complex, 6 to 12 percent slopes, eroded 41
931C2—Formdale-Langhei complex, 6 to 12 percent slopes, eroded 82
942D2—Langhei-Barnes complex, 12 to 20 percent slopes, eroded 100
943D2—Langhei-Formdale complex, 12 to 20 percent slopes, eroded 101
943E—Langhei-Formdale complex, 20 to 30 percent slopes 101
951B—Nebish-Sugarbush complex, 2 to 8 percent slopes 119
951C—Nebish-Sugarbush complex, 8 to 15 percent slopes 120
951E—Nebish-Sugarbush complex, 15 to 30 percent slopes 120
1015—Udipsamments, cut and fill land 156
1016—Udorthents, loamy, cut and fill land 156
1027—Udorthents, wet substratum, fill land 156
1030—Pits, gravel-Udipsamments complex 127
1104B—Waukon-Dorset complex, 1 to 8 percent slopes 164
1104C—Waukon-Dorset complex, 8 to 15 percent slopes 164
1111—Nidaros muck, frequently flooded 121

1113—Haslie, Seelyeville, and Cathro soils, ponded 94
1125B—Sverdrup-Abbeylake complex, 1 to 6 percent slopes 151
1125C—Sverdrup-Abbeylake complex, 6 to 12 percent slopes 152
1126B—Verndale-Nymore complex, 1 to 6 percent slopes 161
1127A—Bootlake-Graycalm complex, 0 to 2 percent slopes 48
1127B—Bootlake-Graycalm complex, 2 to 8 percent slopes 49
1128—Cathro muck, frequently flooded 53
1129—Lindaas silty clay loam, morainic 105
1130—Wolverton fine sandy loam 167
1131B—Verndale-Abbeylake complex, 1 to 6 percent slopes 161
1132B—Eagleview-Balmlake complex, 1 to 8 percent slopes 66
1132C—Eagleview-Balmlake complex, 8 to 15 percent slopes 66
1132E—Eagleview-Balmlake complex, 15 to 30 percent slopes 67
1135—Foxlake silty clay loam 84
1136—Nidaros muck 122
1137B—Birchlake silty clay loam, 1 to 6 percent slopes 44
1137C—Birchlake silty clay loam, 6 to 12 percent slopes, eroded 44
1137D—Birchlake silty clay loam, 12 to 20 percent slopes, eroded 44
1137E—Birchlake silty clay loam, 20 to 30 percent slopes 45
1138—Rushlake and Hangaard soils, lake beaches 136
1140B—Eagleview-Snellman complex, 1 to 8 percent slopes 67
1140C—Eagleview-Snellman complex, 8 to 15 percent slopes 68
1149—Hamerly clay loam 91
1195B—Sybil-Eagleview complex, 2 to 8 percent slopes 153
1195C—Sybil-Eagleview complex, 8 to 15 percent slopes 154
1195E—Sybil-Eagleview complex, 15 to 30 percent slopes 154
1196B—Lida-Two Inlets complex, 1 to 8 percent slopes 103
1196C—Lida-Two Inlets complex, 8 to 15 percent slopes 103
1196E—Lida-Two Inlets complex, 15 to 30 percent slopes 104
1200—Egglake loam 73
1201C—Sugarbush-Snellman complex, 8 to 15 percent slopes 150
1201E—Sugarbush-Snellman complex, 15 to 35 percent slopes 150
1210—Paddock-Epoufette complex 126
1211—Egglake-Cathro complex 73
1225—Wykeham-Karlstad complex 169
1227—Quam, Cathro, and Urness soils, ponded 129
1230—Haslie and Nidaros soils, ponded 95
1234B—Formdale-Buse complex, 2 to 6 percent slopes 83
1235B—Formdale-Buse-Sandberg complex, 2 to 6 percent slopes 83
1236B—Eagleview loamy sand, 1 to 8 percent slopes 69
1236C—Eagleview loamy sand, 8 to 15 percent slopes 69
1236E—Eagleview loamy sand, 15 to 30 percent slopes 69
1238E—Two Inlets-Sugarbush complex, 15 to 30 percent slopes 155
1242D—Sandberg-Arvilla complex, 12 to 20 percent slopes 137
1243B—Sol sandy loam, 2 to 8 percent slopes, very stony 145
1243C—Sol sandy loam, 8 to 15 percent slopes, very stony 145
1243E—Sol sandy loam, 15 to 30 percent slopes, very stony 146
1244B—Sol-Sugarbush complex, 2 to 8 percent slopes, very stony 146

1244C—Sol-Sugarbush complex, 8 to 15 percent slopes, very stony 147
1244E—Sol-Sugarbush complex, 15 to 30 percent slopes, very stony 147
1246—Winger silty clay loam 166
1247D—Corliss-Dorset complex, 12 to 20 percent slopes 58
1248C—Nymore-Verndale complex, 6 to 12 percent slopes 123
1249C—Graycalm-Bootlake complex, 8 to 15 percent slopes 89
1250C—Abbeylake-Verndale complex, 6 to 12 percent slopes 32
1251—Lamoure silt loam, channeled, frequently flooded 100
1252B—Bootlake-Eagleview complex, 1 to 8 percent slopes 49
1263C—Eagleview-Bootlake complex, 8 to 15 percent slopes 70
1291—Sedgeville loam, frequently flooded 138
1306—Karlstad sandy loam 97
1317—Vallers silty clay loam 158
1318—Darnen loam 61
1319B—Rockwood sandy loam, 2 to 6 percent slopes, stony 132
1319C—Rockwood sandy loam, 6 to 12 percent slopes, stony 132
1319D—Rockwood sandy loam, 12 to 20 percent slopes, stony 133
1320B—Blowers sandy loam, 1 to 5 percent slopes, stony 46
1321—Paddock fine sandy loam, stony 127
1365—Hillview fine sandy loam 96
1825B—Seelyeville muck, seep land, 1 to 10 percent slopes 139
1878—Hamre muck 92
1938—Lakepark clay loam 98
1942—Forada mucky loam, depressional 77
1967—Hamerly-Vallers complex 91
1975—Oylen sandy loam 125
1997—Vallers-Hamerly-Winger complex 159

Summary of Tables

Part I

Temperature and precipitation 7
Freeze dates in spring and fall 8
Growing season 8
Classification of the soils 23
Acreage and proportionate extent of the soils 25

Part II

(Page numbers are in the Summary of Tables in Part II)

Classification of the soils
Acreage and proportionate extent of the soils
Cropland management considerations
Land capability and yields per acre of crops and pasture
Prime farmland
Windbreaks and environmental plantings
Windbreak suitability groups
Forest land harvest equipment considerations
Forest haul road considerations
Forest log landing considerations
Forest land site preparation and planting considerations
Recreational development
Wildlife habitat
Building site development
Sanitary facilities
Construction materials
Water management
Engineering index properties
Physical properties of the soils
Chemical properties of the soils
Water features
Soil features

This page intentionally left blank.

Foreword

This soil survey contains information that can be used in land-planning programs in Becker County, Minnesota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service.

William Hunt
State Conservationist
Natural Resources Conservation Service

This page intentionally left blank.

Soil Survey of Becker County, Minnesota

By Keith A. Christensen, Natural Resources Conservation Service

Fieldwork by Keith A. Christensen, Malvern N. Jacobsen, Rodney G. Kyar, and Michael L. Lieser, Natural Resources Conservation Service, and Ronald R. Schwartz, Minnesota Agricultural Experiment Station

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Minnesota Agricultural Experiment Station

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Soil scientists were denied access to a few tracts of land in the county. These areas are identified with cross-hatching on the map sheets. They were mapped by using knowledge of the surrounding area and aerial photograph interpretation. The delineations of the soils are less accurate on these tracts than in areas where soil scientists had access to the land and could examine the soils.

Survey Procedures

The general procedures followed in making this survey are described in the "National Soil Survey Handbook" (USDA/NRCS) and the "Soil Survey Manual" (USDA, 1993). Soil survey maps made for conservation planning purposes on individual farms prior to the start of the project and the "Geologic Map of Minnesota" (Hobbs and Goebel, 1982) were among the references used.

Before the fieldwork began, soil scientists studied U.S. Geological Survey topographic maps, at a scale of 1:24,000, to relate land and image features. Sample areas were selected to represent the major landscapes in the county. These areas were investigated more closely than the rest of the county. Traverses were made across the landscape to determine the types of soil occurring on the landscape and the percentages of the different types of soils. In areas of the Formdale-Langhei-Flom association and in other areas where the soil pattern is very complex, traverses were more closely spaced. In areas of the Verndale-Dorset association and in other areas where the soil pattern is relatively simple, traverses were more widely spaced. As the traverses were made, the soil scientists divided the landscape into landforms or landform segments based on use and management of the soils. For example, a hill was separated on the maps from a depression and a gently sloping summit from a very steep back slope of a ridge. In most areas soil examinations along the traverses were made 50 to 100 yards apart, depending on the landscape and the pattern of soils. Extensive notes were taken on the composition of map units in these preliminary study areas. As mapping progressed, these preliminary notes were modified and a final assessment of the composition of the individual map units was made.

Several pedon descriptions were written for each of the soil types mapped in the county. The pedons described as typical were observed and studied in pits that were dug with shovels, spades, or backhoes. Each pedon was separated into different soil horizons, or layers, and the texture, color, reaction, structure, and content of coarse fragments were determined for each layer.

Before the fieldwork began, several different flights of aerial photography were observed to determine which flight was of the highest quality. Approximately 75 percent of the county was soil mapped on U.S. Geological Survey aerial photography flown between the years of 1957 and 1973. The rest of the county was mapped on National High Altitude Photography (NHAP) flown in 1984 and 1985.

During the soil mapping process, preliminary boundaries of slopes and landforms were plotted stereoscopically on aerial photographs. In the field, the soil boundaries were refined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined to a depth of 5 or 6 feet

with the aid of power equipment mounted on pickup trucks or with hand augers where access by motor vehicle was not practical. Traverses across the landscape in areas of cropland typically were spaced about 600 feet apart. Soil borings were typically made every 5 to 10 acres, depending on the complexity of the landscape. In wooded areas, traverses across the landscape typically were spaced about 1,000 feet apart and soil borings were made every 10 to 15 acres, depending on the complexity of the landscape.

Samples for chemical and physical analyses were taken from representative sites of several of the soils in the survey area. The chemical and physical analyses were made by the Soil Survey Laboratory, Department of Soil Science, University of Minnesota. The results of the analyses are stored in a computerized data file at the laboratory. A description of the laboratory procedures and results of the laboratory analyses can be obtained on request from the laboratory. Soil samples were also analyzed in the Detroit Lakes soil survey office. Some of the soil properties determined locally include particle-size analysis, pH, and calcium carbonate content.

General Nature of the Survey Area

Becker County is in west-central Minnesota (fig. I-1). It has a surface area of about 1,440 square miles. The county is 48 miles long from west to east and 30 miles wide from north to south. The county has seven incorporated cities and villages. These are Audubon, Callaway, Detroit Lakes, Frazee, Lake Park, Ogema, White Earth, and Wolf Lake. Detroit Lakes is the county seat. It had a population of 7,174 in 1993. In 1990, the population of Becker County was 27,881.

The county has a land area of approximately 839,700 acres. It has about 84,600 acres of water; this acreage consists of bodies of water that are 40 acres or more in size (USDA, 1982). Approximately 295,000 acres in the county is used as cropland, 80,500 acres as pastureland, and 323,000 acres as woodland. About 141,200 acres consists primarily of wetlands and small bodies of water (less than 40 acres in size), but this acreage also includes roads and urban land.

Approximately 181,600 acres in Becker County is under county, State, or Federal ownership. Federal lands total approximately 49,600 acres. These lands are managed primarily by the U.S. Fish and Wildlife Service. State lands total approximately 56,300 acres and are managed by the Minnesota Department of Natural Resources. County lands total approximately 75,700 acres and are managed by the Becker County Natural Resources Department.

For the purposes of this soil survey, soil scientists identified about 75 different types of soils in Becker County. The soils range widely in texture, natural drainage, and other characteristics. Soils in the western one-third of the county are dark because the original vegetation was mainly tall grass prairie. Soils in the eastern two-thirds of the county are lighter colored because the original vegetation was deciduous and coniferous forest.

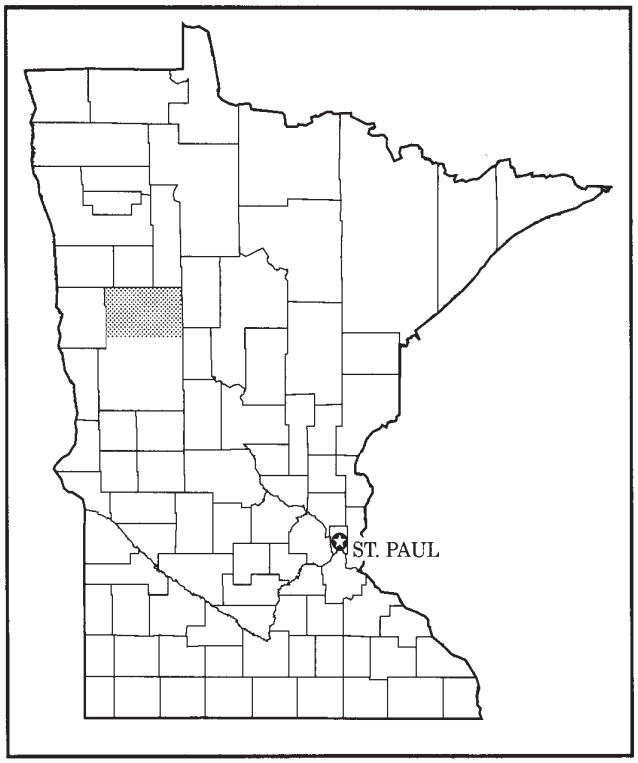


Figure I-1.—Location of Becker County in Minnesota.

History

Becker County was established by an act of the Legislature on March 18, 1858 (Wilcox, 1907). It was named in honor of General George L. Becker of St. Paul. Becker was a lawyer who served as a land commissioner for the old St. Paul and Pacific Railroad. He never actually served in the military. He was elected mayor of St. Paul in 1856 and later served as a congressman and as a State legislator.

For 10 years after the establishment of Becker County, the Chippewa Indians occupied nearly all of the area. The Sioux tribe had about one-half of Cormorant Township and a small part of Lake Park Township. The Treaty of 1867 established a reservation in the northern part of Becker County for the Chippewa Indians. Approximately 200 Chippewa arrived at the reservation

from the Chippewa Agency near Crow Wing on June 14, 1868. The Indians named the place White Earth because of the white clay they found under the black soil. Government loggers clear-cut part of the timber on the east side of White Earth Lake during the winter of 1867-1868 and sawed the logs into lumber to be used by the Indians for building shelters.

Until the 1860's, the only Europeans in the area were trappers and explorers. In 1802, the first non-Indian settlements in Becker County were established. These were two small trading posts that were set up at White Earth and Shell Lake by men employed by the Northwest Fur Company. The trading posts remained but a short time. The first permanent European settler in Becker County was Patrick Quinlan, who established a homestead on May 28, 1868, in the southwest quarter of section 35 in Burlington Township. The site is near the present-day city of Frazee. Quinlan believed that he was settling in Otter Tail County but actually had settled a few hundred feet inside Becker County.

Most of the government surveying was begun in 1870 and was completed by the end of 1872. In the summer of 1870, speculation that the Northern Pacific Railroad would pass through the county brought an influx of settlers. Construction on the railroad began during the fall of 1870 and was completed the following year. Most of the early settlement took place on the prairie soils in the western part of the county. Prior to 1879, there were few settlers in the eastern part of the county. During the summer of 1879, several settlers moved onto the Ponsford Prairie. The eastern townships were more or less settled by 1890, but they were less densely populated than those in the western part because the wooded areas had to be cleared before a crop could be planted.

During the period from 1880 to 1919, the lumber industry swept through the county. Many of the white pine, red pine, and oak trees were cut.

Logging History

Logging in Becker County dates back to the early 1870's, when the pine harvesting began. Red pine and white pine stands were first harvested near Toad Lake and floated down the Toad River to the Otter Tail River to a sawmill in Fergus Falls. The pine harvested near the Shell and Straight Rivers was cut and floated down the Crow Wing River to Little Falls and Minneapolis. The pine that was harvested in Savannah and Two Inlets Townships was floated down the Fish Hook River to a mill in Park Rapids. A large sawmill was constructed at Frazee in 1872 (Vandersluis, 1974). Most of the pine logs in Becker County were sawed at this sawmill until it was closed in 1918. Logs harvested in the northern part of the county were cut and hauled by horses and an inland railroad to landings on Big Elbow Lake and Many Point Lake. A channel was dug from Big Elbow Lake adjacent to Little Bemidji Lake to Many Point Lake. This channel facilitated log movement down the Otter Tail River. The logs were stockpiled during the winter months on the ice near landings. In spring, after the ice broke up, logs were "boomed" down the lakes and river as the water flow was generally greatest following the snowmelt. Logs were floated down the river during the summer as flowage permitted. Typically, a lumberjack would cut wood during the winter months, float the logs to the sawmills in the spring, and work in the sawmills in the summer and the fall.

By 1919, the virgin pine was essentially harvested and very little remained. It was estimated that Becker County had about 500,000,000 board feet of pine before harvesting began in 1871. A few pine stands were of particularly high quality. One tract of 160 acres yielded 4,800,000 board feet of lumber.

The western and southwestern parts of the county were covered with hardwood forests, except the northwestern one-fourth, which was open prairie. Bur oak was originally very abundant in Becker County. An estimated 125 million board feet of oak timber was in the county (Wilcox, 1907). There were also stands of red oak and a few areas of white oak. The white oak variety was not very abundant. Some of the oak was used for railroad ties or lumber, and some was used for fuel by the railroad and by settlers.

The logging industry played an important role in the development of Becker County. People employed by the logging industry provided a market for agricultural products. Forests presently make up about 39 percent of the land area. Large stands of timber are in the north-central and northeastern parts of the county.

Transportation Facilities

Two railroads serve Becker County. One line runs north and south through Detroit Lakes, Callaway, and Ogema, and the other runs east and west through Frazee, Detroit Lakes, Audubon, and Lake Park.

Most of the major highways are paved. State Highways 34 and 87 run east and west through the eastern two-thirds of the county. State Highway 34 connects Detroit Lakes with Park Rapids. State Highway 87 runs from Frazee to Menahga in Wadena County. U.S. Highway 10 is a four-lane highway that enters the county near Frazee and passes through Detroit Lakes, Audubon, and Lake Park on its way across Becker County. U.S. Highway 59 runs north and south through the county and serves the towns of Detroit Lakes, Callaway, and Ogema.

Physiography and Relief

The main geomorphic areas in Becker County include the Alexandria Moraine Area, the Itaska Moraine Area, the Wadena Drumlin Area, the Pelican River Sand Plain, the Park Rapids Sand Plain, and the Mahnomen Till Plain. Nearly half of the 1,440 square miles of the county consists of terminal moraines—the Alexandria Moraine and the Itaska Moraine. The moraine area is in the central part of the county and extends into the southwest and northeast corners. The vertical relief in the moraine ranges to as much as 200 to 300 feet. In places the moraine is more than 20 miles wide (Anderson).

The Alexandria Moraine runs mainly from north to south in the western part of Becker County and contains the drift of two different ice lobes. The bulk of the moraine was deposited at the terminus of the Wadena Lobe, and its deposits are exposed on the east side of the moraine. The moraine was subsequently overridden from the west by the Des Moines Lobe. Glacial till from the Wadena Lobe typically has a sandy loam texture, and glacial till from the Des Moines Lobe typically has a loam or clay loam texture. A narrow band of glacial till with silty clay loam textures also occurs in the western part of the county. The origin of the very clayey glacial till sediments suggests that ice retreated and then readvanced over lake sediments in the Lake Agassiz basin (Fenton and others, 1983). The Des Moines Lobe contains a higher percentage of shale fragments and is thought to have a more northwesterly source area than the Wadena Lobe (Anderson). Relief is typically rolling to very hilly.

The Itaska Moraine runs mainly from east to west across the northern and central parts of Becker County. The moraine is a deposit of the Wadena Lobe. The Itaska Moraine is characterized by sandy loam glacial till. The glacial till is commonly mixed with pockets of sand and gravel (ice-contact deposits). Relief is typically rolling to very hilly.

The Wadena Drumlin Area is in the southeastern part of Becker County. The Wadena Drumlin Field is the largest drumlin field in Minnesota (Wright, 1962). The drumlins were formed by the Wadena Lobe and consist of sandy loam glacial till. In Becker County the long axis of the drumlins has an east-west orientation (Perkins). Relief is typically undulating to rolling.

The Pelican River Sand Plain is located in the southwestern part of Becker County. The glacial outwash consists of sands and gravels deposited primarily by meltwaters of the Des Moines Lobe. Relief is typically rolling to hilly.

The Park Rapids Sand Plain is located in the eastern part of Becker County. The glacial outwash consists of sands and gravels deposited by meltwaters of the Wadena Lobe as it stood at the Itaska Moraine (Wright, 1972a). Relief is typically nearly level or undulating.

The Mahnomen Till Plain is located in the northwestern part of Becker County. The till plain consists primarily of glacial till from the Des Moines Lobe, but the glacial till is mantled in some areas by silty glacial lacustrine sediments. These silty sediments indicate ponding at elevations considerably above the level of the Herman Beach of Lake Agassiz (Fenton and others, 1983). As the glacial ice retreated northward, water began to pond in low areas between the moraine and the retreating glacial ice. The present-day South Branch of the Wild Rice River and the Buffalo River are former meltwater channels that eventually drained these ponded meltwaters into Glacial Lake Agassiz. Relief is typically nearly level or undulating.

The highest elevation in Becker County is about 1,850 feet. This elevation is in section 16 of Wolf Lake Township. The lowest elevation, about 1,150 feet, is in section 19 of Walworth Township.

Drainage

Becker County is located on the watershed divide of North America. The western three-fourths of the county are tributary to the Red River of the North, which flows northward into Hudson Bay. The eastern one-fourth of the county is tributary to the Mississippi River, which flows southward into the Gulf of Mexico.

The rugged topography within the Alexandria and Itaska Moraines prevents good natural drainage throughout a substantial portion of the county. Thus, there are more than 300 lakes that are 40 acres or more in size in these areas. Lakes, rivers, streams, and swamps cover approximately one-fourth of the surface area of the county.

Artificial drainage through surface ditches is extensive in the northwestern part of Becker County. Many shallow depressions have been drained with these shallow ditches and are now being used as cropland. Subsurface tile drainage has not been used extensively in Becker County.

Geologic History

Precambrian metamorphic and igneous rocks form the lowermost geologic unit in Becker County. The depth to these rocks generally ranges from 300 to more than 600 feet. Cretaceous sedimentary rocks overlie the Precambrian bedrock in parts of the county. These consist of sandstone and shale.

Glacial drift of Wisconsin Age forms the uppermost geologic unit in Becker County. The glacial drift is among the thickest in Minnesota and ranges from about 300 to 600 feet in thickness. The deposits of several

glaciers are buried beneath the surficial glacial deposits (Clayton and Moran, 1982). Glacial advances by the Wadena Lobe and the Des Moines Lobe deposited the bulk of the surficial deposits in Becker County.

The Wadena Lobe advanced from a northerly direction, crossing the Winnipeg lowlands in southern Manitoba, where it incorporated limestone rocks and deposited loamy materials rich in carbonates (Wright, 1962). Its earliest advance built the Alexandria Moraine and the Wadena Drumlin Field. The Wadena Lobe then retreated northward and readvanced to build the Itaska Moraine about 20,000 years ago (Wright, 1972b). Within the Itaska Moraine are several areas of linear ridges, called "push ridges" or "thrust ridges" (Norton, 1982), which are a series of steeply sloping ridges. Among the more noteworthy areas of push ridges in Becker County are an area west of Flat Lake and an area east of Strawberry Lake.

The most recent glacial advance was that of the Des Moines Lobe, which reached its maximum southerly extent about 14,000 years ago. The Des Moines Lobe advanced from a north-northwesterly direction, crossing Manitoba, where it incorporated limestone rocks. It followed the Red River Valley and incorporated shale-rich materials derived from Cretaceous rocks (Sackreiter). The final retreat of glacial ice from Minnesota is estimated to have occurred about 11,500 years ago.

The most recent deposits are nonglacial in origin and consist of alluvium deposited on flood plains and organic or limnic sediments in lakes and depressions. The accumulation of these organic deposits in depressional areas is estimated to have begun about 4,000 years ago (Norton).

Water Supply

Water supplies are obtained from tapping deposits of Pleistocene glacial outwash. The thickness of the Pleistocene glacial deposits ranges from about 300 to 600 feet. The most widely used aquifers are beds of sand and gravel that are buried within the glacial deposits.

Climate

The three tables at the end of this section give climate data for the survey area as recorded at Detroit Lakes during the period from 1961 to 1990.

In winter, the average temperature is 8.6 degrees F and the average daily minimum temperature is -2 degrees. The lowest temperature on record, which occurred at Detroit Lakes on February 15, 1936, is -46 degrees. In summer, the average temperature is 65.9 degrees and the average daily maximum temperature is 78.6 degrees. The highest temperature, which occurred at Detroit Lakes on July 7, 1936, is 107 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 24.40 inches. Of this, about 16.70 inches, or 68 percent, usually falls in May through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.4 inches at Detroit Lakes on August 11, 1909. The heaviest rainfall recorded in a 24-hour period was 7.5 inches on July 15 and 16, 1993, at Callaway. Thunderstorms occur on about 32 days each year, and most occur in July.

The average seasonal snowfall is 42.8 inches. The greatest snow depth at any one time during the period of record was 48 inches on March 18, 1943. On an average, 120 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches on January 7, 1989.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 67 percent of the time in summer and 50 percent in winter. The prevailing wind is from the north-northwest. Average windspeed is highest, 14 miles per hour, in April.

TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Detroit Lakes, Minnesota)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	15.5	-6.5	4.5	43	-40	0	0.72	0.26	1.10	2	10.4
February----	22.4	-0.9	10.7	48	-38	0	.56	.21	.84	2	5.9
March-------	35.8	14.1	25.0	63	-28	16	.99	.46	1.45	2	7.3
April-------	54.3	29.5	41.9	83	3	149	1.78	.66	2.72	4	2.8
May---------	68.1	41.2	54.7	87	20	458	2.60	1.28	3.75	6	.0
June--------	75.8	50.7	63.3	92	32	694	4.16	2.24	5.84	7	.0
July--------	81.0	55.4	68.2	95	37	864	3.78	1.93	5.39	6	.0
August------	79.1	53.3	66.2	95	33	806	3.34	1.61	4.83	5	.0
September---	68.4	43.6	56.0	89	19	478	2.82	1.24	4.18	5	.0
October-----	56.3	33.6	44.9	81	11	208	2.06	.63	3.22	4	1.2
November----	36.2	18.9	27.6	62	-13	19	.82	.22	1.30	2	6.2
December----	20.2	1.3	10.7	46	-34	0	.77	.36	1.12	2	9.0
Yearly:											
Average---	51.1	27.9	39.5	---	---	---	---	---	---	---	---
Extreme---	---	---	---	96	-41	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,694	24.40	19.32	28.50	47	42.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Detroit Lakes, Minnesota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 15	May 25	June 7
2 years in 10 later than--	May 10	May 19	June 2
5 years in 10 later than--	Apr. 30	May 10	May 23
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 17	Sept. 12	Aug. 29
2 years in 10 earlier than--	Sept. 23	Sept. 14	Sept. 3
5 years in 10 earlier than--	Oct. 3	Sept. 23	Sept. 12

GROWING SEASON

(Recorded in the period 1961-90 at Detroit Lakes, Minnesota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	129	116	91
8 years in 10	138	122	98
5 years in 10	154	135	114
2 years in 10	170	148	129
1 year in 10	179	155	136

General Soil Map Units

The general soil map shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Nearly Level, Loamy and Silty Soils on Ground Moraines

1. Hamerly-Winger-Vallers Association

Setting

Landform: Moraines
Position on the landform: Hamerly—flats and rises; Winger and Vallers—rims of depressions and flats (fig. I-2)
Slope range: 0 to 3 percent

Composition

Percent of survey area: 10.5
Extent of components in the association:
Hamerly and similar soils—42 percent
Winger and similar soils—23 percent
Vallers and similar soils—16 percent
Minor soils—19 percent

Soil Properties and Qualities

Hamerly
Depth class: Very deep
Drainage class: Moderately well drained and somewhat poorly drained
Parent material: Till
Surface texture: Loam

Winger
Depth class: Very deep
Drainage class: Poorly drained
Parent material: Glaciolacustrine deposits and till
Surface texture: Silty clay loam

Vallers
Depth class: Very deep
Drainage class: Poorly drained
Parent material: Till
Surface texture: Silty clay loam

Minor Soils

- Barnes and similar soils
- Langhei and similar soils
- McIntosh and similar soils
- The depressional Colvin soils and similar soils
- Cathro and similar soils
- Quam and similar soils
- Seelyeville and similar soils

Nearly Level to Moderately Steep, Loamy, Silty, and Organic Soils on Lateral Moraines

2. Formdale-Langhei-Flom Association

Setting

Landform: Moraines
Position on the landform: Formdale and Langhei—back slopes and shoulders; Flom—flats and drainageways (fig. I-3)
Slope range: 0 to 30 percent

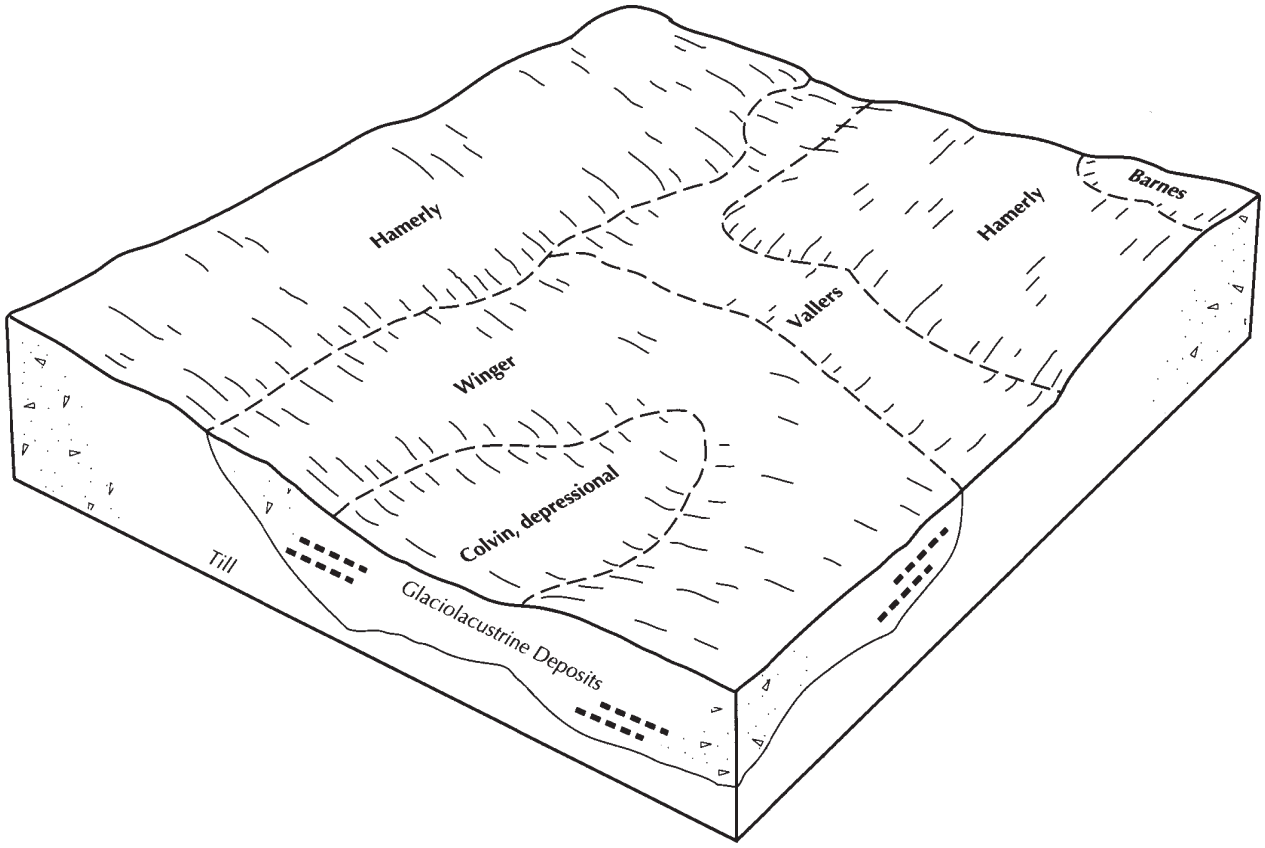


Figure I-2.—Typical pattern of soils and parent material in the Hamerly-Winger-Vallers association.

Composition

Percent of survey area: 9.5
Extent of components in the association:
Formdale soils—41 percent
Langhei soils—20 percent
Flom and similar soils—15 percent
Minor soils—24 percent

Soil Properties and Qualities

Formdale
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam
Slope class: Gently sloping to moderately steep

Langhei
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam
Slope class: Gently sloping to moderately steep

Flom
Depth class: Very deep
Drainage class: Poorly drained
Parent material: Till
Surface texture: Silty clay loam
Slope class: Nearly level

Minor Soils

- Hamerly and similar soils
- Aazdahl and similar soils
- Vallers and similar soils
- Cathro and similar soils
- Seelyeville and similar soils
- Quam and similar soils

3. Barnes-Langhei-Vallers Association

Setting

Landform: Moraines
Position on the landform: Barnes and Langhei—back slopes and shoulders; Vallers—rims of depressions and flats

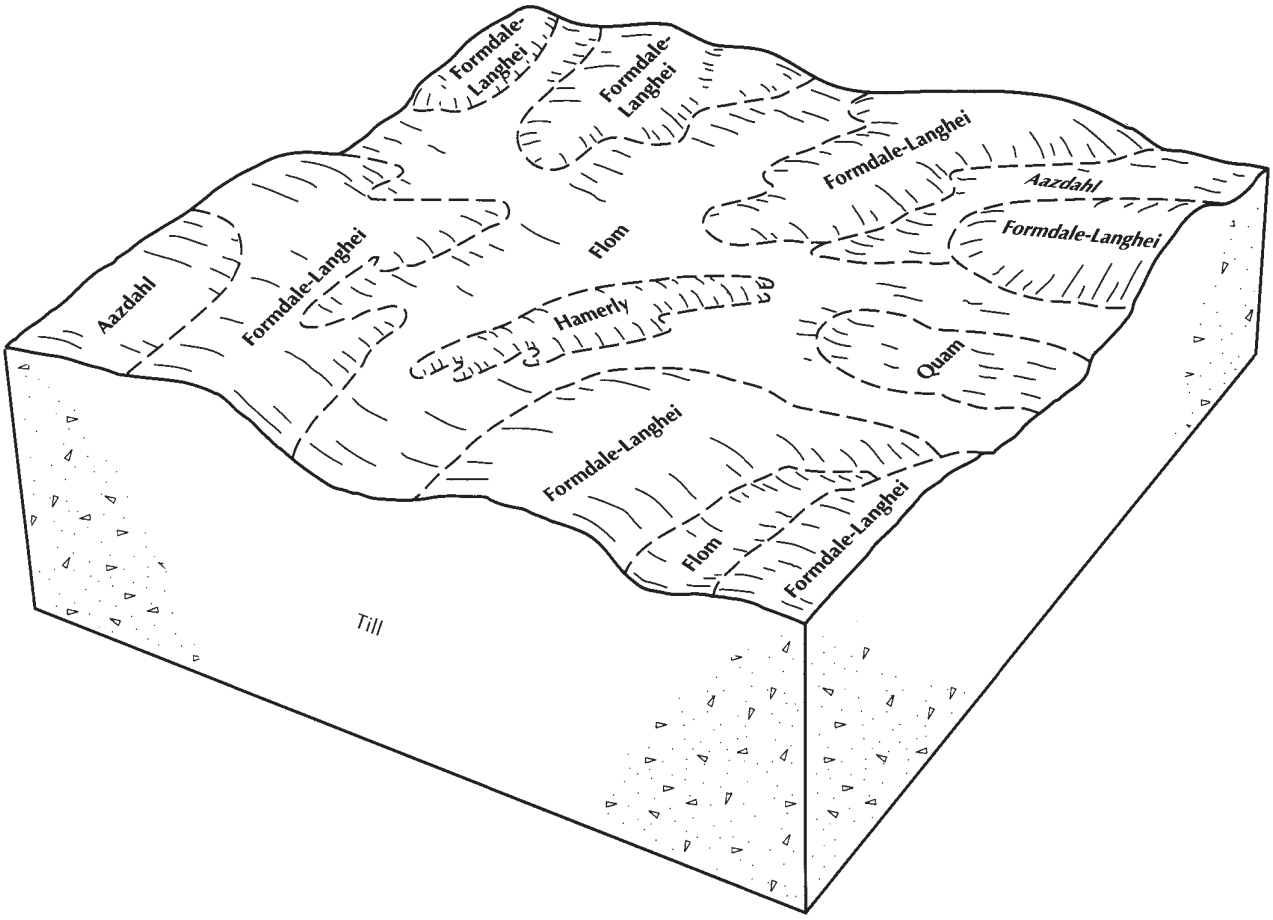


Figure I-3.—Typical pattern of soils and parent material in the Formdale-Langhei-Flom association.

Slope range: 0 to 30 percent

Composition

Percent of survey area: 2.5
Extent of components in the association:
Barnes soils—43 percent
Langhei soils—24 percent
Vallers and similar soils—14 percent
Minor soils—19 percent

Soil Properties and Qualities

Barnes
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Loam
Slope class: Gently sloping to moderately steep

Langhei
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Loam
Slope class: Gently sloping to moderately steep

Vallers
Depth class: Very deep
Drainage class: Poorly drained
Parent material: Till
Surface texture: Silty clay loam
Slope class: Nearly level

Minor Soils

- Hamerly and similar soils
- Flom and similar soils
- Quam and similar soils
- Cathro and similar soils
- Seelyeville and similar soils

4. Waukon-Forman-Cathro Association

Setting

Landform: Moraines
Position on the landform: Waukon and Forman—back slopes and shoulders; Cathro—depressions
Slope range: 0 to 30 percent

Composition

Percent of survey area: 4
Extent of components in the association:
Waukon and similar soils—49 percent
Forman soils—21 percent
Seelyeville and similar soils—12 percent
Minor soils—18 percent

Soil Properties and Qualities

Waukon
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Loam
Slope class: Gently sloping to moderately steep

Forman
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam
Slope class: Gently sloping to moderately steep

Cathro
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck
Slope class: Nearly level

Minor Soils

- Chapett and similar soils
- Beltrami and similar soils
- Flom and similar soils
- Quam and similar soils
- Seelyeville and similar soils

5. Nebish-Seelyeville Association

Setting

Landform: Moraines
Position on the landform: Nebish—back slopes and shoulders; Seelyeville—depressions
Slope range: 0 to 30 percent

Composition

Percent of survey area: 5
Extent of components in the association:
Nebish soils—59 percent
Seelyeville and similar soils—23 percent
Minor soils—18 percent

Soil Properties and Qualities

Nebish
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Loam
Slope class: Gently sloping to moderately steep

Seelyeville
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck
Slope class: Nearly level

Minor Soils

- Beltrami and similar soils
- Dalbo and similar soils
- Smiley and similar soils
- Cathro and similar soils
- Rifle and similar soils

6. Birchlake-Audubon-Foxlake Association

Setting

Landform: Moraines
Position on the landform: Birchlake and Audubon—back slopes, shoulders, and rises; Foxlake—flats and drainageways
Slope range: 0 to 30 percent

Composition

Percent of survey area: 3.5
Extent of components in the association:
Birchlake and similar soils—31 percent
Audubon and similar soils—31 percent
Foxlake and similar soils—14 percent
Minor soils—24 percent

Soil Properties and Qualities

Birchlake
Depth class: Very deep
Drainage class: Moderately well drained
Parent material: Till
Surface texture: Silty clay loam
Slope class: Nearly level to moderately steep

Audubon
Depth class: Very deep
Drainage class: Moderately well drained

Parent material: Till
Surface texture: Silty clay loam
Slope class: Nearly level to moderately steep

Foxlake
Depth class: Very deep
Drainage class: Poorly drained
Parent material: Till
Surface texture: Silty clay loam
Slope class: Nearly level

Minor Soils

- Bygland and similar soils
- Lindaas and similar soils
- Dovray and similar soils
- Cathro and similar soils
- Seelyeville and similar soils

7. Naytahwaush-Seelyeville Association

Setting

Landform: Moraines
Position on the landform: Naytahwaush—back slopes and shoulders; Seelyeville—depressions
Slope range: 0 to 30 percent

Composition

Percent of survey area: 0.5
Extent of components in the association:
Naytahwaush soils—50 percent
Seelyeville and similar soils—25 percent
Minor soils—25 percent

Soil Properties and Qualities

Naytahwaush
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Loam
Slope class: Gently sloping to moderately steep

Seelyeville
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck
Slope class: Nearly level

Minor Soils

- Dalbo and similar soils
- Auganaush and similar soils
- Lindaas and similar soils
- Dovray and similar soils
- Cathro and similar soils
- Rifle and similar soils

Nearly Level to Moderately Steep, Dense, Loamy Soils on Drumlins

8. Blowers-Paddock-Rockwood Association

Setting

Landform: Drumlins
Position on the landform: Blowers—back slopes and shoulders; Paddock—flats, foot slopes, and toe slopes; Rockwood—back slopes and shoulders (fig. I-4)
Slope range: 0 to 20 percent

Composition

Percent of survey area: 4.5
Extent of components in the association:
Blowers soils—39 percent
Paddock soils—29 percent
Rockwood soils—21 percent
Minor soils—11 percent

Soil Properties and Qualities

Blowers
Depth class: Very deep
Potential rooting depth: Moderately deep to dense till
Drainage class: Moderately well drained
Parent material: Till
Surface texture: Sandy loam
Slope class: Gently sloping

Paddock
Depth class: Very deep
Potential rooting depth: Deep to dense till
Drainage class: Poorly drained
Parent material: Till
Surface texture: Loam
Slope class: Nearly level

Rockwood
Depth class: Very deep
Potential rooting depth: Moderately deep to dense till
Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam
Slope class: Gently sloping to moderately steep

Minor Soils

- Rosy and similar soils
- Hillview and similar soils
- Cathro and similar soils
- Seelyeville and similar soils

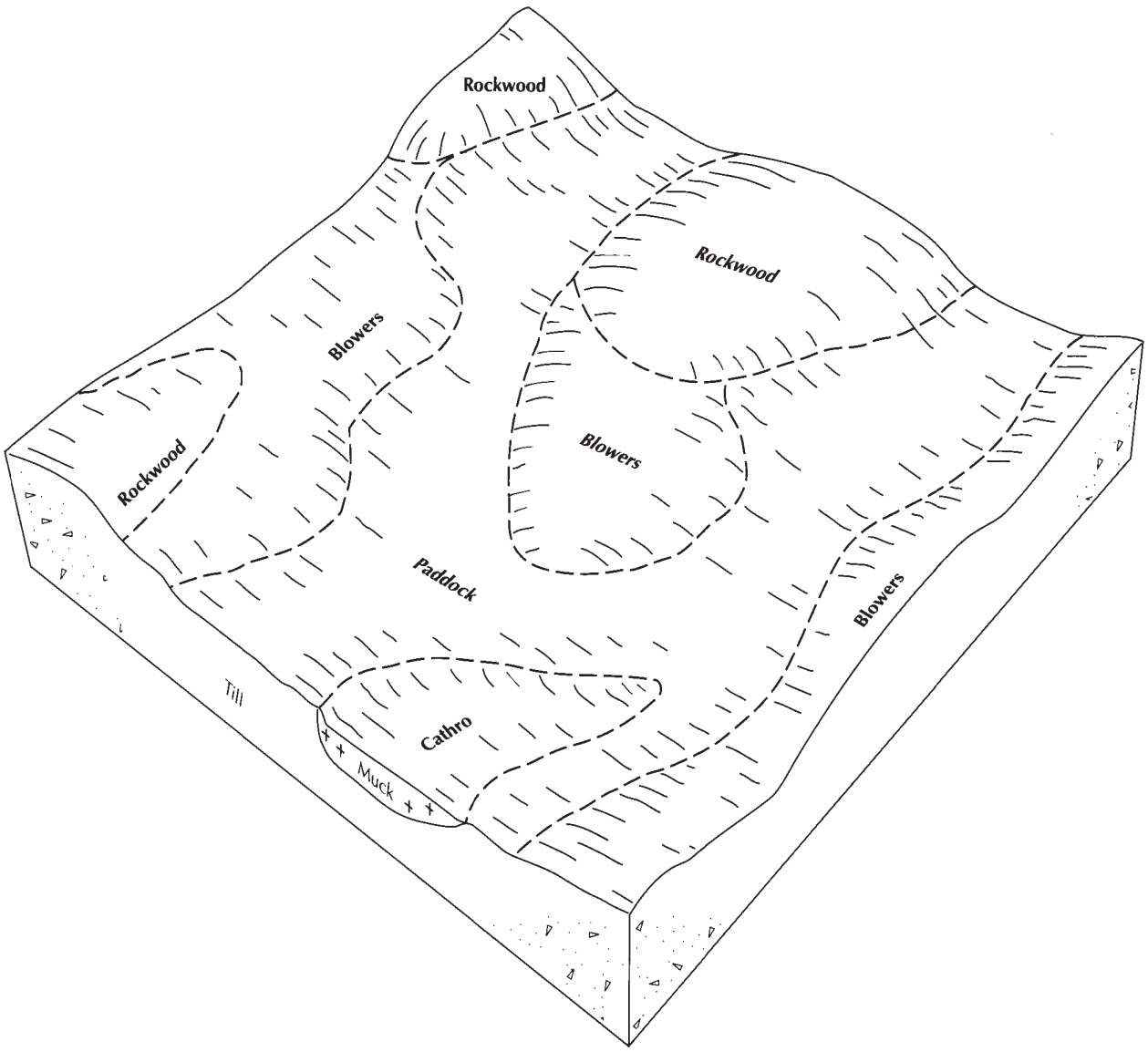


Figure I-4.—Typical pattern of soils and parent material in the Blowers-Paddock-Rockwood association.

Nearly Level to Steep, Loamy, Sandy, and Organic Soils on End Moraines and Ground Moraines

9. Snellman-Rifle-Sugarbush Association

Setting

Landform: Moraines
Position on the landform: Snellman and Sugarbush—back slopes and shoulders; Rifle—depressions
Slope range: 0 to 35 percent

Composition

Percent of survey area: 25.5
Extent of components in the association:
Snellman soils—49 percent
Rifle and similar soils—23 percent
Sugarbush soils—13 percent
Minor soils—15 percent

Soil Properties and Qualities

Snellman
Depth class: Very deep

Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam
Slope class: Gently sloping to steep

Rifle
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Mucky peat
Slope class: Nearly level

Sugarbush
Depth class: Very deep
Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Gently sloping to steep

Minor Soils

- Two Inlets and similar soils
- Nebish and similar soils
- Wykeham and similar soils
- Dalbo and similar soils
- Smiley and similar soils
- Cathro and similar soils
- Seelyeville and similar soils

10. Sol-Lupton-Sugarbush Association

Setting

Landform: Moraines
Position on the landform: Sol and Sugarbush—back slopes and shoulders; Lupton—depressions
Slope range: 0 to 30 percent

Composition

Percent of survey area: 3.5
Extent of components in the association:
Sol soils—47 percent
Lupton and similar soils—23 percent
Sugarbush soils—13 percent
Minor soils—17 percent

Soil Properties and Qualities

Sol
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam
Slope class: Gently sloping to moderately steep

Lupton
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck
Slope class: Nearly level

Sugarbush
Depth class: Very deep
Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Gently sloping to moderately steep

Minor Soils

- Two Inlets and similar soils
- Balmlake and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils
- Seelyeville and similar soils

11. Eagleview-Seelyeville-Snellman Association

Setting

Landform: Moraines
Position on the landform: Eagleview and Snellman—back slopes and shoulders; Seelyeville—depressions
Slope range: 0 to 30 percent

Composition

Percent of survey area: 1.5
Extent of components in the association:
Eagleview and similar soils—41 percent
Seelyeville and similar soils—25 percent
Snellman and similar soils—17 percent
Minor soils—17 percent

Soil Properties and Qualities

Eagleview
Depth class: Very deep
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Loamy sand
Slope class: Gently sloping to moderately steep

Seelyeville
Depth class: Very deep
Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck
Slope class: Nearly level

Snellman
Depth class: Very deep
Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam

Slope class: Gently sloping to moderately steep

Minor Soils

- Nebish and similar soils
- Beltrami and similar soils
- Friendship and similar soils
- Karlstad and similar soils
- Egglake and similar soils
- Meehan and similar soils
- Cathro and similar soils
- Rifle and similar soils

Nearly Level to Steep, Loamy and Sandy Soils on Outwash Plains and Valley Trains

12. Arvilla-Sandberg Association

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders (fig. I-5)
Slope range: 2 to 35 percent

Composition

Percent of survey area: 3
Extent of components in the association:
Arvilla and similar soils—42 percent
Sandberg and similar soils—29 percent
Minor soils—29 percent

Soil Properties and Qualities

Arvilla
Depth class: Very deep
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Gently sloping to moderately steep

Sandberg
Depth class: Very deep
Drainage class: Excessively drained
Parent material: Glacial outwash
Surface texture: Coarse sandy loam
Slope class: Gently sloping to moderately steep

Minor Soils

- Corliss and similar soils
- Sverdrup and similar soils
- Fordville and similar soils
- Osakis and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

13. Verndale-Dorset-Corliss Association

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes, shoulders, and flats
Slope range: 0 to 35 percent

Composition

Percent of survey area: 10.5
Extent of components in the association:
Verndale and similar soils—28 percent
Dorset soils—25 percent
Corliss and similar soils—16 percent
Minor soils—31 percent

Soil Properties and Qualities

Verndale
Depth class: Very deep
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Nearly level to strongly sloping

Dorset
Depth class: Very deep
Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Nearly level to moderately steep

Corliss
Depth class: Very deep
Drainage class: Excessively drained
Parent material: Glacial outwash
Surface texture: Loamy coarse sand
Slope class: Gently sloping to steep

Minor Soils

- Abbeylake and similar soils
- Lida and similar soils
- Fordville and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils
- Seelyeville and similar soils

14. Sugarbush-Graycalm-Two Inlets Association

Setting

Landform: Outwash plains and valley trains

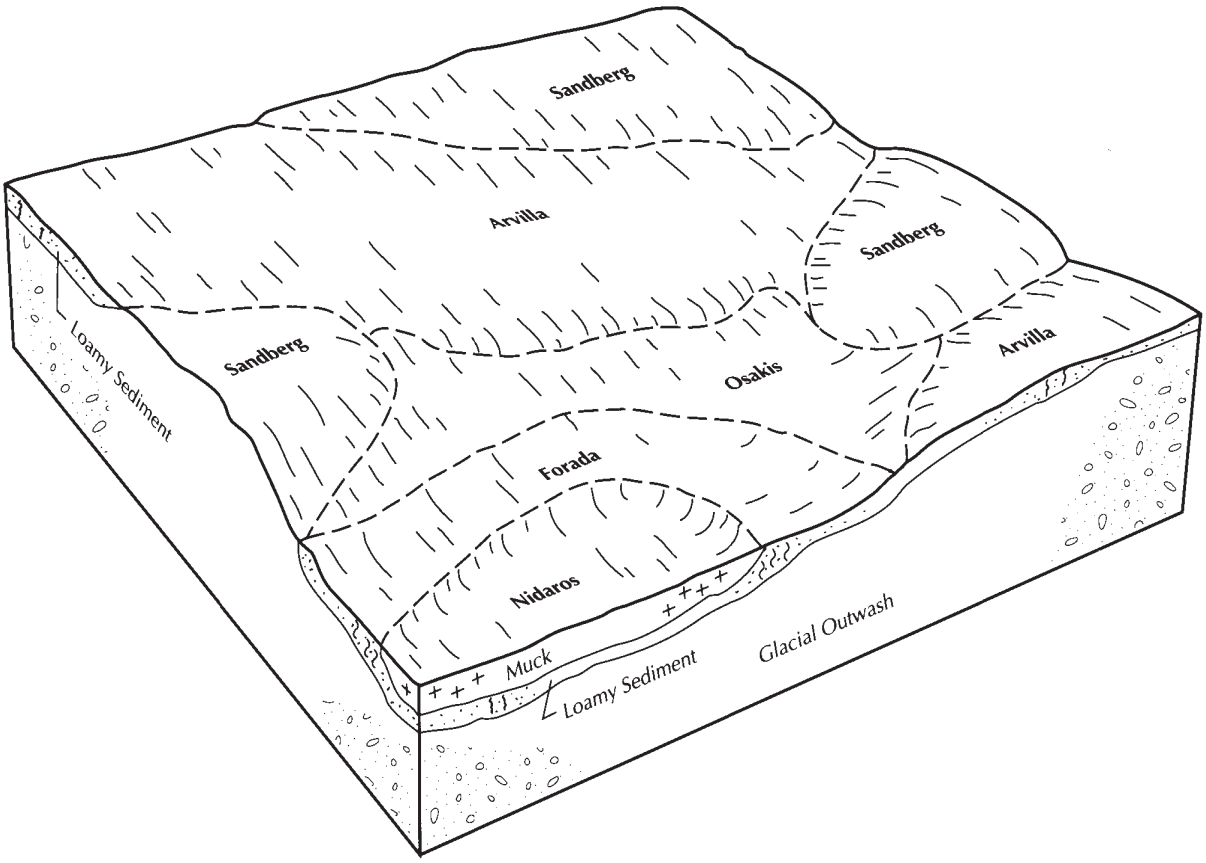


Figure I-5.—Typical pattern of soils and parent material in the Arvilla-Sandberg association.

Position on the landform: Back slopes, shoulders, and flats
Slope range: 1 to 30 percent

Composition

Percent of survey area: 16
Extent of components in the association:
Sugarbush and similar soils—29 percent
Graycalm soil and similar soils—23 percent
Two Inlets soils—17 percent
Minor soils—31 percent

Soil Properties and Qualities

Sugarbush
Depth class: Very deep
Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam
Slope class: Gently sloping to moderately steep

Graycalm
Depth class: Very deep
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Loamy sand
Slope class: Gently sloping to moderately steep

Two Inlets
Depth class: Very deep
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Loamy coarse sand
Slope class: Gently sloping to moderately steep

Minor Soils

- Menahga and similar soils
- Eagleview and similar soils
- Bootlake and similar soils
- Karlstad and similar soils
- Epoufette and similar soils
- Meehan and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils
- Seelyeville and similar soils

This page intentionally left blank.

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification (Jenny, 1941). The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Formation of the Soils

A soil is a three-dimensional natural body consisting of mineral and organic material that can support plant growth. The nature of any soil at a given site is the result of the interaction of five general factors—the composition of the parent material; the climate under which the soil material has accumulated; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material. Differences among the soils are caused by variations in one or more of these factors. Horizons or distinct layers were formed in the soils of Becker County by many processes, including accumulation of organic matter, leaching of carbonates and salts, formation and transfer of clay, and oxidation or reduction of iron. The following paragraphs relate the factors of soil formation to the soils in the survey area.

Climate

The climate in Becker County has significantly affected the soil-forming processes. Climatic factors, such as precipitation and temperature, have influenced the plant and animal communities and the physical and chemical weathering of the parent material.

During the glacial period, the advancing glaciers spread over the county and buried the existing boreal forests and the existing soils. The cold temperatures reduced the rate of chemical reactions in the parent materials being deposited by the glacier. The postglacial climate progressively warmed and then stabilized about 5,000 years ago. The warming climate is evidenced by successive vegetation types. The initial postglacial vegetation was spruce forest. The spruce forest was replaced by pine and deciduous forest. The deciduous forest was replaced by prairie in the northwestern part of the county when the climate stabilized. Becker County currently has a cool, subhumid, continental climate characterized by cold winters and hot summers.

Climate influences soil formation mainly through the effects of precipitation and temperature. Water dissolves soluble materials, such as carbonates, and transfers them either upward or downward within the soil profile. Water is also needed to transfer clay particles to the lower layers of the soil profile.

Temperature affects the rate at which chemical and physical weathering proceed. Freezing of the soil during the winter essentially stops the soil-forming processes. Alternate freezing and thawing in the spring and fall play a part in the development of soil structure and the weathering of soil particles. Chemical reactions occur more rapidly during the summer, when soil temperatures are higher.

The microclimate in a given area can affect soil formation. Quam soils, which are in depressions or low areas, receive runoff from the higher adjacent slopes. The runoff creates a wet microclimate that results in prolonged saturation. This saturation results in the reduction of iron, which causes grayish colors in the subsoil. Sloping soils, such as Formdale soils, formed under a drier microclimate because some of the precipitation is lost through runoff. These soils have better internal drainage than the Quam soils. The resulting oxidation of iron causes a yellowish brown subsoil.

Living Organisms

All forms of life, both in and on the soil, influence the chemical and biological processes of soil formation. Bacteria, earthworms, and other forms of animal life aid in the weathering of materials and the decomposition of organic matter. Plants, including fungi, influence formation by returning decaying plant residue to the soil and aiding in decomposition. Plant roots loosen the soil and bring minerals up from the parent material. The vegetation influences the soil structure and the

movement of nutrients up and down through the soil. Earthworms, insects, and small burrowing animals mix the soil and create small channels that influence soil aeration and the percolation of water. Earthworms help to incorporate crop residue and leaf litter into the soil.

Two types of vegetation, prairie and forest, have strongly influenced the formation of the soils in Becker County. Prairie vegetation occupied about one-fourth of the area at the time the county was settled, mainly in the northwestern part of the county (Marshner, 1974). Soils that formed under prairie vegetation have a thicker, darker surface layer than soils that formed under forest vegetation. Fire has had some effect on limiting tree growth in this area. Soils that formed under forest vegetation characteristically have a thinner, lighter colored surface layer than soils that formed under prairie vegetation and have an accumulation of clay in the subsoil.

Human activities have significantly influenced soil formation. Native forests have been cleared and developed for farming and other uses. Cultivation has accelerated the rate of erosion of the surface layer in the more sloping areas. The surface layer of some of the well drained soils has become browner as a result of mixing with the subsoil and reduction of the content of organic matter. Cultivation has affected soil structure and compaction and has reduced the content of organic matter. Fertilizer applications have increased the fertility of many soils. The drainage of wet soils has prevented further accumulations of organic and limnic sediments in many depressions.

Topography

The topography of the land has an influence on soil-forming processes. As the degree of slope increases, the potential for runoff increases. Steeply sloping soils receive less water for percolation through the soil profile because more water runs off these soils than soils in more gently sloping positions. As the runoff rate increases, the potential for erosion increases. The surface soil becomes thinner in areas upslope but becomes thicker on foot slopes because of erosional processes.

Slope aspect influences soil moisture and soil temperature. Soils on south- and west-facing slopes receive more sunlight and thus are warmer and drier than soils on north- and east-facing slopes.

Position on the landscape influences the natural drainage characteristics of a soil. Soils high on the landscape typically are not saturated with water in the soil profile. Soils low on the landscape may have a seasonal high water table and be saturated with water for extended periods of time. Soils in depressions commonly are ponded and remain saturated year-round unless they are artificially drained.

Soil color is influenced by the oxidation status of the soil. Yellow and brown colors are common under well drained conditions. Subdued colors, such as grays and blues, are common under poorly drained conditions.

Relief varies greatly in Becker County. On the ground moraine in the northwestern part of the county and on the Ponsford Prairie outwash plain in the eastern part of the county, the slopes are nearly level to gently undulating. Relief is more pronounced throughout the rest of the county, especially in areas of the Alexandria and Itaska end moraines where slopes are very steep. More information about relief is given in the section "General Nature of the Survey Area."

Parent Material

The landscape of Becker County was shaped by the Ice Age, when a series of glaciers spread over the county and deposited glacial drift. Glacial drift is a general term that applies to all rock material, including clay, silt, sand, gravel, and boulders, that has been transported by the glacier and deposited by melting ice or by meltwater flowing from the ice. The pattern of soils is complex because more than one glacial lobe is exposed at the surface in Becker County. The lobes came from different source areas, and they brought with them materials of different physical and chemical properties. The debris remaining after the glaciers had melted provided the parent material in which most of the soils in Becker County formed.

Till is material that was deposited directly by glacial ice with little or no water action. It typically has particles that vary in size, including sand, silt, clay, and larger particles, such as gravel, cobbles, and boulders. The till was deposited in moraines whose topography ranges from nearly level plains (ground moraines) to steeply sloping hills (end moraines or terminal moraines). Approximately 50 percent of the soils in Becker County formed in till sediments. The till soils in the western one-half of the county were deposited by the Des Moines Lobe and typically contain more than 18 percent clay in the parent material. Formdale, Barnes, Langhei, Forman, Waukon, and Nebish soils are examples of soils that formed in Des Moines Lobe till deposits. The till soils in the eastern one-half of the county were deposited by the Wadena Lobe and typically contain less than 18 percent clay in the parent material. Snellman, Rockwood, Chapett, Blowers, and Wykeham soils are examples of soils that formed in Wadena Lobe till deposits.

Glacial outwash resulted when, as the glacial ice melted during warm seasons, meltwater flowed from the margins of the ice sheet and was redeposited as a partly sorted mixture of sand and gravel. The size of the

rock particles that can be carried suspended in water depends on the speed of the moving water. As the water velocity decreases, the finer particles are able to settle out instead of being carried in suspension. In some areas the sands and gravels have a mantle of loamy sediments that may be 2 or more feet thick. Approximately 25 percent of the soils in Becker County formed in glacial outwash sediments. Arvilla, Dorset, Verndale, Sugarbush, and Bootlake soils are examples of soils that formed in glacial outwash sediments.

Waters flowing from a melting glacier commonly were blocked by ice or glacial debris and formed lakes and ponds. These waters were laden with silts and clays, which settled out as the flow ceased, forming lacustrine deposits. Approximately 10 percent of the soils in Becker County formed in glacial lacustrine sediments. The lacustrine sediments occur locally within the Itaska and Alexandria Moraines and on the till plain in the northwestern part of the county. Dalbo, Bygland, and Lindaas soils formed in glacial lacustrine sediments.

To a minor extent, other kinds of parent material also occurred in Becker County. Alluvium is material that was deposited by water on the flood plains along streams, generally after the glacial period. Soils that formed in alluvium are typically stratified with gravel, sand, silt, and clay. The texture of the soil material varies, depending on the velocity of the floodwater, the duration of the flooding, and the distance from the streambed. Lamoure and Fordum soils formed in alluvium.

Colluvium is soil material deposited by water or wind at the base of slopes, in drainageways, and in depressions on the uplands. These sediments are typically silty or loamy. Lakepark and Darnen soils are examples of soils that formed in colluvium. Less than 1 percent of the soils formed in alluvial or colluvial sediments.

Organic soils formed in decomposed plant material that accumulated from vegetation growing in marshes and depressions. Some of the deeper ice-block depressions within the moraines initially were filled with limnic sediments (primarily coprogenous earth) until the water became shallow enough to support herbaceous vegetation. Such plants as cattails, sedges, reeds, grasses, and some shrubs thrive in this environment. The high water table reduces the rate of decomposition; therefore, plant materials accumulate faster than they can decompose.

Approximately 15 percent of the soils in Becker County formed in limnic or organic sediments. The thickness of organic material ranges from a few inches to more than 10 feet. Sapric organic materials are highly decomposed and commonly are black. Hemic organic materials are less decomposed and commonly are reddish brown. The organic materials in the western one-third of the county are primarily sapric, and those in the eastern two-thirds of the county are mixed sapric and hemic.

Near the town of Ogema is an extensive area of fens, which receive a substantial amount of their water from ground water (springs). The ground water rises to the surface because of hydrostatic pressure. The peat in these fens typically is highly calcareous because the ground water contains a high amount of calcium.

Time

The length of time that the parent material has been exposed to the soil-forming processes influences the nature of the soil that forms. The soils in Becker County are geologically young because the last glacial period ended between 10,000 and 20,000 years ago. Young soils generally are more fertile than older soils because leaching and other soil-forming processes have not altered the parent material as much.

Even though the soils are geologically young, enough time has elapsed for the parent material to weather into soils that have distinct horizons. In many of the forested soils, including Nebish, Snellman, and Rockwood soils, carbonates have been leached to a depth of 2 to 4 feet, clay has been translocated from the surface and subsurface layers to the subsoil, and organic matter has accumulated in the surface layer.

The youngest soils in Becker County, such as Lamoure and Fordum soils, formed in recent alluvium. These soils may be stratified and have weakly expressed horizons because the soil-forming processes are interrupted with each new deposition.

Processes of Soil Formation

Soils form through complex processes that are grouped into four general categories. These are additions, removals, transfers, and transformations. These processes affect soil formation in differing degrees.

The accumulation of organic matter in the A horizon of the mineral soils in the county is an example of an addition. This accumulation is the main reason for the dark color of the A horizon. The leaching of lime from the upper 2 to 4 feet in many of the soils in the county is an example of removal. The parent material of these soils was initially limy throughout, but the lime has been leached from the upper part of the profile by percolating water. The translocation of clay from the A and E horizons to the B horizon in many of the forested soils in the county is an example of a transfer. The A and E horizons are zones of eluviation, or loss. The B horizon is a zone of illuviation, or gain. The B horizon has more clay than the parent material initially had. Thin clay films

are in pores and on faces of peds in the B horizon. An example of a transformation is the reduction of iron. This process takes place under wet, saturated conditions in which there is no oxygen. Gleying, or the reduction of iron, is evident in Flom, Winger, and Colvin soils, which have a dominantly gray subsoil. Reduced iron is soluble, but it commonly has been moved short distances in the soils. Part of this iron can be reoxidized and segregated in the form of stains or concretions.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquolls (*Endo*, meaning within, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, frigid Typic Endoaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aazdahl	Aquic Haploborolls, fine-loamy, mixed
Abbeylake	Typic Udipsamments, mixed, frigid
Arvilla	Udic Haploborolls, sandy, mixed
Audubon	Vertic Haploborolls, fine, montmorillonitic
Auganaush	Mollic Albaqualfs, fine, montmorillonitic, frigid
Balmlake	Typic Eutroboralfs, coarse-loamy, mixed
Barnes	Udic Haploborolls, fine-loamy, mixed
Beltrami	Aquic Eutroboralfs, fine-loamy, mixed
Birchlake	Aquic Argiborolls, fine, montmorillonitic
Blowers	Glossaquic Eutroboralfs, coarse-loamy, mixed
Bootlake	Typic Eutroboralfs, coarse-loamy, mixed
Boyerlake	Vertic Eutrochrepts, fine, montmorillonitic, frigid
Buse	Typic Calciborolls, fine-loamy, mixed
Bygland	Aquertic Argiborolls, fine, montmorillonitic
Cathro	Terric Borosaprists, loamy, mixed, euic
Chapett	Boralfic Udic Argiborolls, fine-loamy, mixed
Colvin	Typic Calciaquolls, fine-silty, frigid
Corliss	Typic Udipsamments, mixed, frigid
Dalbo	Vertic Eutroboralfs, fine, montmorillonitic
Darnen	Pachic Udic Haploborolls, fine-loamy, mixed
Dorset	Udic Argiborolls, coarse-loamy, mixed
Dovray	Cumulic Vertic Epiaquolls, fine, montmorillonitic, frigid
Eagleview	Argic Udipsamments, mixed, frigid
Egeland	Udic Haploborolls, coarse-loamy, mixed
Egglake	Mollic Endoaqualfs, fine-loamy, mixed, frigid
Epoufette	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Flom	Typic Endoaquolls, fine-loamy, mixed, frigid
Forada	Typic Endoaquolls, coarse-loamy, mixed, frigid
Fordville	Pachic Udic Haploborolls, fine-loamy over sandy or sandy-skeletal, mixed
Forman	Udic Argiborolls, fine-loamy, mixed
Formdale	Udic Haploborolls, fine-loamy, mixed
Foxlake	Vertic Epiaquolls, fine, montmorillonitic, frigid
Friendship	Typic Udipsamments, mixed, frigid
Gonvick	Aquic Argiborolls, fine-loamy, mixed
Graycalm	Argic Udipsamments, mixed, frigid
Hamerly	Aeric Calciaquolls, fine-loamy, frigid
Hamre	Histic Humaquepts, fine-loamy, mixed, nonacid, frigid
Hangaard	Typic Endoaquolls, sandy, mixed, frigid
Haslie	Limnic Borosaprists, coprogenous, euic
Hillview	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Karlstad	Aquic Eutroboralfs, coarse-loamy, mixed
Lakepark	Cumulic Endoaquolls, fine-loamy, mixed, frigid
Lamoure	Cumulic Endoaquolls, fine-silty, mixed (calcareous), frigid
Langhei	Typic Eutrochrepts, fine-loamy, mixed, frigid
Lida	Mollic Eutroboralfs, coarse-loamy, mixed
Lindaas	Typic Argiaquolls, fine, montmorillonitic, frigid
Lupton	Typic Borosaprists, euic
McIntosh	Aeric Calciaquolls, fine-silty, frigid
Meehan	Aquic Udipsamments, mixed, frigid
Menahga	Typic Udipsamments, mixed, frigid
Mooselake	Typic Borohemists, euic
Naytahwaush	Mollic Eutroboralfs, fine, montmorillonitic
Nebish	Typic Eutroboralfs, fine-loamy, mixed
Nidaros	Terric Borosaprists, loamy, mixed, euic
Nymore	Typic Udipsamments, mixed, frigid
Osakis	Aquic Haploborolls, sandy, mixed
Oylen	Aquic Argiborolls, coarse-loamy, mixed
Paddock	Udollic Epiaqualfs, coarse-loamy, mixed, frigid
Quam	Cumulic Endoaquolls, fine-silty, mixed, frigid
Rifle	Typic Borohemists, euic
Rockwell	Typic Calciaquolls, coarse-loamy, frigid
Rockwood	Mollic Eutroboralfs, coarse-loamy, mixed
Rosy	Glossaquic Eutroboralfs, coarse-loamy, mixed
Runeberg	Typic Endoaquolls, coarse-loamy, mixed, frigid

CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Rushlake	Aquic Udipsamments, mixed, frigid
Sandberg	Udorthentic Haploborolls, sandy, mixed
Sedgeville	Fluvaquentic Endoaquolls, coarse-loamy, mixed, frigid
Seelyeville	Typic Borosaprists, euic
Smiley	Typic Argiaquolls, fine-loamy, mixed, frigid
Snellman	Typic Eutroboralfs, fine-loamy, mixed
Sol	Glossic Eutroboralfs, fine-loamy, mixed
Sugarbush	Typic Eutroboralfs, coarse-loamy, mixed
Sverdrup	Udic Haploborolls, sandy, mixed
Sybil	Mollic Eutroboralfs, sandy, mixed
Two Inlets	Psammentic Eutroboralfs, sandy, mixed
Udipsamments	Udipsamments
Udorthents	Udorthents
Urness	Mollic Fluvaquents, fine-silty, mixed (calcareous), frigid
Vallers	Typic Calciaquolls, fine-loamy, frigid
Verndale	Udic Argiborolls, coarse-loamy, mixed
Waukon	Mollic Eutroboralfs, fine-loamy, mixed
Winger	Typic Calciaquolls, fine-silty, frigid
Wolverton	Aquic Calciborolls, coarse-loamy, mixed
Wykeham	Aquic Eutroboralfs, fine-loamy, mixed
Wyndmere	Aeric Calciaquolls, coarse-loamy, frigid

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
20B	Chapett fine sandy loam, 2 to 8 percent slopes	1,730	0.2
20C2	Chapett fine sandy loam, 8 to 15 percent slopes, eroded	1,880	0.2
20E	Chapett fine sandy loam, 15 to 30 percent slopes	680	*
26	Aazdahl clay loam	3,110	0.3
33B	Barnes loam, 2 to 6 percent slopes	1,740	0.2
36	Flom silty clay loam	5,620	0.6
38B	Waukon loam, 2 to 8 percent slopes	6,730	0.7
38C	Waukon loam, 8 to 15 percent slopes	5,710	0.6
38E	Waukon loam, 15 to 30 percent slopes	2,300	0.3
40B	Nebish loam, 2 to 8 percent slopes	8,280	0.9
40C	Nebish loam, 8 to 15 percent slopes	9,650	1.0
40E	Nebish loam, 15 to 30 percent slopes	3,470	0.4
47	Colvin silty clay loam	940	0.1
63	Rockwell loam	2,390	0.2
108	McIntosh silt loam	3,820	0.4
111	Hangaard sandy loam	1,090	0.1
121	Wykeham fine sandy loam	3,820	0.4
125	Beltrami loam	4,380	0.5
133A	Dalbo silt loam, 0 to 2 percent slopes	3,620	0.4
133B	Dalbo silt loam, 2 to 8 percent slopes	3,280	0.4
133C	Dalbo silt loam, 8 to 15 percent slopes	1,330	0.2
133E	Dalbo silt loam, 15 to 30 percent slopes	280	*
137	Dovray silty clay	800	*
141B	Egeland fine sandy loam, 1 to 6 percent slopes	980	0.1
141C	Egeland fine sandy loam, 6 to 12 percent slopes	310	*
168B	Forman clay loam, 2 to 6 percent slopes	2,770	0.3
168C2	Forman clay loam, 6 to 12 percent slopes, eroded	3,110	0.3
168D2	Forman clay loam, 12 to 20 percent slopes, eroded	1,310	0.2
168E	Forman clay loam, 20 to 30 percent slopes	250	*
171B	Formdale clay loam, 2 to 5 percent slopes	8,580	0.9
180	Gonvick loam	810	*
184	Hamerly loam	10,330	1.1
191	Epoufette sandy loam	3,070	0.3
202	Meehan loamy sand	1,140	0.1
207D	Nymore loamy sand, 12 to 20 percent slopes	690	*
267B	Snellman sandy loam, 2 to 8 percent slopes	13,680	1.5
267C	Snellman sandy loam, 8 to 15 percent slopes	28,960	3.1
267E	Snellman sandy loam, 15 to 30 percent slopes	11,280	1.2
315A	Bootlake sandy loam, 0 to 2 percent slopes	370	*
315B	Bootlake sandy loam, 2 to 5 percent slopes	640	*
332B	Sugarbush sandy loam, 1 to 8 percent slopes	1,820	0.2
335	Urness mucky silt loam	3,760	0.4
339	Fordville loam	1,480	0.2
344	Quam silty clay loam	3,730	0.4
351	Colvin silty clay loam, depressional	1,090	0.1
375	Forada loam	3,360	0.4
398	Winger silty clay loam, depressional	2,380	0.2
406A	Dorset sandy loam, 0 to 2 percent slopes	3,610	0.4
406B	Dorset sandy loam, 2 to 6 percent slopes	8,730	0.9
413	Osakis sandy loam	560	*
418	Lamoure silty clay loam, occasionally flooded	1,510	0.2
422B	Bygland silty clay loam, 1 to 6 percent slopes	1,420	0.2
422C	Bygland silty clay loam, 6 to 15 percent slopes	290	*
503B	Balmlake fine sandy loam, 1 to 8 percent slopes	1,770	0.2
503C	Balmlake fine sandy loam, 8 to 15 percent slopes	700	*
503E	Balmlake fine sandy loam, 15 to 30 percent slopes	400	*
508	Wyndmere fine sandy loam	980	0.1
540	Seelyeville muck	15,580	1.7
541	Rifle mucky peat	51,540	5.6
544	Cathro muck	14,730	1.6
564	Friendship loamy sand	2,610	0.3
567A	Verndale sandy loam, 0 to 2 percent slopes	11,750	1.3

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
567B	Verndale sandy loam, 2 to 6 percent slopes	5,050	0.5
579C2	Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded	920	*
624	Rosy sandy loam	850	*
701	Runeberg mucky loam, depressional	2,400	0.2
711B	Arvilla-Sandberg complex, 2 to 6 percent slopes	5,960	0.6
711C	Arvilla-Sandberg complex, 6 to 12 percent slopes	8,200	0.9
718B	Naytahwaush loam, 2 to 8 percent slopes	820	*
718C	Naytahwaush loam, 8 to 15 percent slopes	1,110	0.1
718E	Naytahwaush loam, 15 to 30 percent slopes	460	*
721E	Corliss loamy sand, 20 to 35 percent slopes	690	*
746	Haslie muck	16,410	1.8
747B	Audubon silty clay loam, 0 to 6 percent slopes	3,860	0.4
753D	Abbeylake loamy sand, 12 to 20 percent slopes	900	*
753E	Abbeylake loamy sand, 20 to 30 percent slopes	910	*
765	Smiley loam	3,640	0.4
767	Auganaush loam	110	*
775B	Sugarbush-Two Inlets complex, 1 to 8 percent slopes	18,850	2.0
775C	Sugarbush-Two Inlets complex, 8 to 15 percent slopes	20,990	2.3
776B	Snellman-Sugarbush complex, 2 to 8 percent slopes	18,810	2.0
776C	Snellman-Sugarbush complex, 8 to 15 percent slopes	35,090	3.8
776E	Snellman-Sugarbush complex, 15 to 30 percent slopes	18,250	2.0
778B	Dorset-Corliss complex, 1 to 6 percent slopes	6,640	0.7
778C	Dorset-Corliss complex, 6 to 12 percent slopes	4,880	0.5
780B	Audubon-Boyerlake complex, 1 to 6 percent slopes	2,290	0.3
780C2	Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded	3,220	0.3
780D2	Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded	1,010	0.1
785	Hamerly-Winger complex	13,640	1.5
786	Winger-Hamerly-Colvin complex	11,370	1.2
797	Mooselake and Lupton soils	7,200	0.8
867B	Graycalm-Menahga complex, 1 to 8 percent slopes	3,210	0.3
867C	Graycalm-Menahga complex, 8 to 15 percent slopes	2,720	0.3
867E	Graycalm-Menahga complex, 15 to 30 percent slopes	1,840	0.2
903B	Barnes-Langhei complex, 2 to 6 percent slopes	6,840	0.7
903C2	Barnes-Langhei complex, 6 to 12 percent slopes, eroded	4,010	0.4
931C2	Formdale-Langhei complex, 6 to 12 percent slopes, eroded	17,010	1.8
942D2	Langhei-Barnes complex, 12 to 20 percent slopes, eroded	1,320	0.1
943D2	Langhei-Formdale complex, 12 to 20 percent slopes, eroded	4,560	0.5
943E	Langhei-Formdale complex, 20 to 30 percent slopes	690	*
951B	Nebish-Sugarbush complex, 2 to 8 percent slopes	3,020	0.3
951C	Nebish-Sugarbush complex, 8 to 15 percent slopes	2,790	0.3
951E	Nebish-Sugarbush complex, 15 to 30 percent slopes	820	*
1015	Udipsamments, cut and fill land	990	0.1
1016	Udorthents, loamy, cut and fill land	330	*
1027	Udorthents, wet substratum, fill land	410	*
1030	Pits, gravel-Udipsamments complex	1,430	0.2
1104B	Waukon-Dorset complex, 1 to 8 percent slopes	540	*
1104C	Waukon-Dorset complex, 8 to 15 percent slopes	990	0.1
1111	Nidaros muck, frequently flooded	1,110	0.1
1113	Haslie, Seelyeville, and Cathro soils, ponded	6,950	0.8
1125B	Sverdrup-Abbeylake complex, 1 to 6 percent slopes	1,300	0.2
1125C	Sverdrup-Abbeylake complex, 6 to 12 percent slopes	380	*
1126B	Verndale-Nymore complex, 1 to 6 percent slopes	4,190	0.4
1127A	Bootlake-Graycalm complex, 0 to 2 percent slopes	3,830	0.4
1127B	Bootlake-Graycalm complex, 2 to 8 percent slopes	3,980	0.4
1128	Cathro muck, frequently flooded	1,360	0.2
1129	Lindaas silty clay loam, morainic	3,300	0.4
1130	Wolverton fine sandy loam	1,600	0.2
1131B	Verndale-Abbeylake complex, 1 to 6 percent slopes	3,580	0.4
1132B	Eagleview-Balmlake complex, 1 to 8 percent slopes	2,580	0.3
1132C	Eagleview-Balmlake complex, 8 to 15 percent slopes	1,620	0.2
1132E	Eagleview-Balmlake complex, 15 to 30 percent slopes	610	*
1135	Foxlake silty clay loam	2,140	0.2

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
1136	Nidaros muck	6,430	0.7
1137B	Birchlake silty clay loam, 1 to 6 percent slopes	3,500	0.4
1137C	Birchlake silty clay loam, 6 to 12 percent slopes, eroded	2,750	0.3
1137D	Birchlake silty clay loam, 12 to 20 percent slopes, eroded	1,230	0.1
1137E	Birchlake silty clay loam, 20 to 30 percent slopes	240	*
1138	Rushlake and Hangaard soils, lake beaches	3,460	0.4
1140B	Eagleview-Snellman complex, 1 to 8 percent slopes	2,470	0.3
1140C	Eagleview-Snellman complex, 8 to 15 percent slopes	1,510	0.2
1149	Hamerly clay loam	4,650	0.5
1195B	Sybil-Eagleview complex, 2 to 8 percent slopes	220	*
1195C	Sybil-Eagleview complex, 8 to 15 percent slopes	260	*
1195E	Sybil-Eagleview complex, 15 to 30 percent slopes	110	*
1196B	Lida-Two Inlets complex, 1 to 8 percent slopes	340	*
1196C	Lida-Two Inlets complex, 8 to 15 percent slopes	920	*
1196E	Lida-Two Inlets complex, 15 to 30 percent slopes	550	*
1200	Egglake loam	4,290	0.5
1201C	Sugarbush-Snellman complex, 8 to 15 percent slopes	5,110	0.6
1201E	Sugarbush-Snellman complex, 15 to 35 percent slopes	4,880	0.5
1210	Paddock-Epoufette complex	1,600	0.2
1211	Egglake-Cathro complex	2,890	0.3
1225	Wykeham-Karlstad complex	900	*
1227	Quam, Cathro, and Urness soils, ponded	3,950	0.4
1230	Haslie and Nidaros soils, ponded	10,300	1.1
1234B	Formdale-Buse complex, 2 to 6 percent slopes	16,360	1.8
1235B	Formdale-Buse-Sandberg complex, 2 to 6 percent slopes	970	0.1
1236B	Eagleview loamy sand, 1 to 8 percent slopes	5,970	0.6
1236C	Eagleview loamy sand, 8 to 15 percent slopes	5,040	0.5
1236E	Eagleview loamy sand, 15 to 30 percent slopes	3,420	0.4
1238E	Two Inlets-Sugarbush complex, 15 to 30 percent slopes	12,080	1.3
1242D	Sandberg-Arvilla complex, 12 to 20 percent slopes	3,100	0.3
1243B	Sol sandy loam, 2 to 8 percent slopes, very stony	850	*
1243C	Sol sandy loam, 8 to 15 percent slopes, very stony	3,500	0.4
1243E	Sol sandy loam, 15 to 30 percent slopes, very stony	800	*
1244B	Sol-Sugarbush complex, 2 to 8 percent slopes, very stony	2,300	0.3
1244C	Sol-Sugarbush complex, 8 to 15 percent slopes, very stony	6,600	0.7
1244E	Sol-Sugarbush complex, 15 to 30 percent slopes, very stony	3,000	0.3
1246	Winger silty clay loam	7,720	0.8
1247D	Corliss-Dorset complex, 12 to 20 percent slopes	1,260	0.1
1248C	Nymore-Verndale complex, 6 to 12 percent slopes	1,730	0.2
1249C	Graycalm-Bootlake complex, 8 to 15 percent slopes	2,160	0.2
1250C	Abbeylake-Verndale complex, 6 to 12 percent slopes	3,580	0.4
1251	Lamoure silt loam, channeled, frequently flooded	890	*
1252B	Bootlake-Eagleview complex, 1 to 8 percent slopes	7,390	0.8
1263C	Eagleview-Bootlake complex, 8 to 15 percent slopes	4,020	0.4
1291	Sedgeville loam, frequently flooded	700	*
1306	Karlstad sandy loam	3,680	0.4
1317	Vallers silty clay loam	10,630	1.2
1318	Darnen loam	380	*
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony	6,750	0.7
1319C	Rockwood sandy loam, 6 to 12 percent slopes, stony	1,530	0.2
1319D	Rockwood sandy loam, 12 to 20 percent slopes, stony	160	*
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony	15,130	1.6
1321	Paddock fine sandy loam, stony	7,390	0.8
1365	Hillview fine sandy loam	590	*
1825B	Seelyeville muck, seep land, 1 to 10 percent slopes	2,510	0.3
1878	Hamre muck	1,960	0.2
1938	Lakepark clay loam	4,060	0.4
1942	Forada mucky loam, depressional	1,190	0.1
1967	Hamerly-Vallers complex	14,210	1.5

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
1975	Oylen sandy loam	2,060	0.2
1997	Vallers-Hamerly-Winger complex	6,160	0.7
	Water	84,600	9.2
	Total	924,300	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the

basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Verndale sandy loam, 0 to 2 percent slopes, is a phase of the Verndale series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Snellman-Sugarbush complex, 8 to 15 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Haslie, Seelyeville, and Cathro soils, ponded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Pits component of Pits, gravel-Udipsamments complex is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Aazdahl Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 3 percent
Taxonomic class: Fine-loamy, mixed Aquic Haploborolls

Typical Pedon

Aazdahl clay loam, 2,000 feet west and 200 feet south of the northeast corner of sec. 30, T. 141 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; abrupt smooth boundary.

A—9 to 13 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; clear smooth boundary.

Bw—13 to 19 inches; olive brown (2.5Y 4/3) clay loam; weak fine subangular blocky structure; friable; few fine prominent yellowish brown (10YR 5/6) iron concentrations; about 3 percent gravel; neutral; clear smooth boundary.

Bk—19 to 32 inches; grayish brown (2.5Y 5/2) clay loam; weak fine subangular blocky structure; friable; common medium distinct yellowish brown (10YR 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 4 percent gravel; violently effervescent; slightly alkaline; gradual smooth boundary.

C—32 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; friable; common medium distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 17 to 27 inches
Thickness of the mollic epipedon: 10 to 16 inches
Content of rock fragments: 2 to 8 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—clay loam

Bw horizon:
Hue—2.5Y or 10YR
Value—3 or 4
Chroma—2 to 4
Texture—clay loam or silty clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam, silty clay loam, or loam

C horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 6
Texture—clay loam, silty clay loam, or loam

26—Aazdahl clay loam

Composition

Aazdahl and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Formdale and similar soils
- Langhei and similar soils
- Flom and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Abbeylake Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 30 percent
Taxonomic class: Mixed, frigid Typic Udipsamments

Typical Pedon

Abbeylake loamy sand, 12 to 20 percent slopes, 800 feet east and 1,600 feet north of the southwest corner of sec. 13, T. 138 N., R. 41 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; about 3 percent gravel; slightly acid; abrupt smooth boundary.

Bw—8 to 24 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 3 percent gravel; neutral; clear smooth boundary.

C1—24 to 45 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 4 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

C2—45 to 60 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 percent
Content of rock fragments: 0 to 10 percent gravel

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—sand, coarse sand, loamy sand, or loamy coarse sand

C horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—coarse sand or sand

753D—Abbeylake loamy sand, 12 to 20 percent slopes

Composition

Abbeylake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sverdrup and similar soils
- Verndale and similar soils
- Fordville and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

753E—Abbeylake loamy sand, 20 to 30 percent slopes

Composition

Abbeylake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 20 to 30 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sverdrup and similar soils
- Verndale and similar soils
- Fordville and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1250C—Abbeylake-Verndale complex, 6 to 12 percent slopes

Composition

Abbeylake and similar soils: About 60 percent
Verndale and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Abbeylake
Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

Verndale
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Arvilla Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 2 to 20 percent
Taxonomic class: Sandy, mixed Udic Haploborolls

Typical Pedon

Arvilla sandy loam (fig. I-6), in an area of Arvilla-Sandberg complex, 2 to 6 percent slopes, 600 feet west and 1,800 feet north of the southeast corner of sec. 29, T. 138 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; abrupt smooth boundary.

Bw1—8 to 11 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; clear smooth boundary.

Bw2—11 to 15 inches; dark yellowish brown (10YR 3/4) sandy loam; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; clear smooth boundary.

2Bw3—15 to 17 inches; dark yellowish brown (10YR 4/4) gravelly loamy coarse sand; weak fine subangular blocky structure; very friable; about 15 percent gravel; neutral; clear smooth boundary.

2C—17 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Thickness of the loamy mantle: 14 to 25 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—sandy loam
Content of rock fragments—0 to 7 percent gravel

Bw horizon:
Hue—7.5YR or 10YR
Value—2 to 5
Chroma—2 to 4
Texture—sandy loam or coarse sandy loam
Content of rock fragments—0 to 7 percent gravel

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—gravelly coarse sand or coarse sand
Content of rock fragments—5 to 35 percent gravel

711B—Arvilla-Sandberg complex, 2 to 6 percent slopes

Composition

Arvilla and similar soils: About 65 percent
Sandberg and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 6 percent

Component Description

Arvilla
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches

Organic matter content: Moderate

Sandberg
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Osakis and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

711C—Arvilla-Sandberg complex, 6 to 12 percent slopes

Composition

Arvilla and similar soils: About 50 percent
Sandberg and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Arvilla
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderate

Sandberg
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Osakis and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Audubon Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 20 percent
Taxonomic class: Fine, montmorillonitic Vertic Haploborolls

Typical Pedon

Audubon silty clay loam (fig. I-7), in an area of Audubon-Boyerlake complex, 1 to 6 percent slopes, 1,400 feet north and 100 feet west of the southeast corner of sec. 15, T. 139 N., R. 42 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; about 1 percent gravel; neutral; abrupt smooth boundary.

Bk1—9 to 20 inches; brown (10YR 5/3) silty clay loam; weak fine subangular blocky structure; friable; common light gray (10YR 7/2) filaments and threads of segregated lime; about 1 percent gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—20 to 27 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium angular blocky structure; friable; common fine distinct light brownish gray (10YR 6/2) iron depletions and few fine faint yellowish brown (10YR 5/4) iron concentrations; common light gray (10YR 7/2) filaments and threads of segregated lime; about 1 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—27 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium angular blocky soil aggregates; friable; common medium distinct light brownish gray (2.5Y 6/2) iron depletions and common medium distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 1 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 4 percent
Depth to carbonates: 0 to 20 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 in the upper part and 1 or 2 in the lower part
Texture—silty clay loam

Bk horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—3 or 4
Texture—silty clay, silty clay loam, or clay loam

C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—silty clay, silty clay loam, or clay loam

747B—Audubon silty clay loam, 0 to 6 percent slopes

Composition

Audubon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rises on moraines
Slope range: 0 to 6 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 3 to 6 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boyerlake and similar soils
- Foxlake and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

780B—Audubon-Boyerlake complex, 1 to 6 percent slopes

Composition

Audubon and similar soils: About 70 percent
Boyerlake and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Audubon—1 to 6 percent; Boyerlake—3 to 6 percent

Component Description

Audubon
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained

Dominant parent material: Till
Flooding: None
Depth to the water table: 3 to 6 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: High

Boyerlake
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

780C2—Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded

Composition

Audubon and similar soils: About 65 percent
Boyerlake and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Audubon
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 3 to 6 feet
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches
Organic matter content: High

Boyerlake
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

780D2—Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded

Composition

Audubon and similar soils: About 60 percent
Boyerlake and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Audubon
Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 3 to 6 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: High

Boyerlake
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Auganaush Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; lower part—slow or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, frigid Mollic Albaqualfs

Typical Pedon

Auganaush loam, 2,120 feet north and 500 feet east of the southwest corner of sec. 35, T. 144 N., R. 40 W., in Clearwater County, Minnesota:

A—0 to 5 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; many fine roots; about 1 percent gravel; slightly acid; clear wavy boundary.

E—5 to 8 inches; dark grayish brown (2.5Y 4/2) loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; common medium distinct dark olive gray (5Y 3/2) iron depletions; many fine roots; about 1 percent gravel; moderately acid; clear irregular boundary.

Btg1—8 to 17 inches; grayish brown (2.5Y 5/2) clay; moderate medium subangular blocky structure; very firm; common fine distinct olive (5Y 5/3) iron concentrations; common medium roots; common moderately thick very dark grayish brown (2.5Y 3/2) clay films on faces of peds and in pores; about 1 percent gravel; slightly acid; gradual wavy boundary.

Btg2—17 to 22 inches; olive gray (5Y 5/2) silty clay loam; moderate medium subangular blocky structure; firm; few medium distinct light olive brown (2.5Y 5/4) iron concentrations; few medium roots; common moderately thick very dark grayish brown (2.5Y 3/2) clay films on faces of peds and in pores; about 2 percent gravel; neutral; gradual wavy boundary.

Btg3—22 to 38 inches; olive gray (5Y 5/2) silty clay loam; weak medium subangular blocky structure; firm; common medium prominent light olive brown (2.5Y 5/6) iron concentrations; few medium roots; few thin very dark grayish brown (2.5Y 3/2) clay films in pores and on fracture faces; few light gray (10YR 7/2) filaments and threads of segregated lime; slightly effervescent; slightly alkaline; about 2 percent gravel; clear wavy boundary.

Cg—38 to 60 inches; light olive gray (5Y 6/2) silty clay loam; massive; firm; common medium prominent light olive brown (2.5Y 5/4) and few fine faint olive (5Y 5/4) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 16 to 40 inches
Content of rock fragments: 1 to 8 percent

Ap or A horizon:
Hue—2.5Y, 10YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam

E horizon:
Hue—10YR or 2.5Y

Value—4 to 6
Chroma—1 or 2
Texture—loam or silt loam

Btg horizon:
Hue—5Y or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay, silty clay, or silty clay loam

Cg horizon:
Hue—5Y or 2.5Y
Value—5 to 7
Chroma—1 or 2
Texture—silty clay loam, clay loam, or silty clay

767—Auganaush loam

Composition

Auganaush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Naytahwaush and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Balmlake Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid or moderate; lower part—moderate
Landform: Moraines, outwash plains, and valley trains
Parent material: Glaciolacustrine deposits
Slope range: 1 to 30 percent
Taxonomic class: Coarse-loamy, mixed Typic Eutroboralfs

Typical Pedon

Balmlake fine sandy loam, 15 to 30 percent slopes, 2,250 feet east and 1,800 feet north of the southwest corner of sec. 2, T. 142 N., R. 39 W.

A—0 to 2 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; strongly acid; abrupt smooth boundary.

E—2 to 15 inches; brown (10YR 5/3) fine sandy loam, light gray (10YR 7/2) dry; weak thin platy structure; very friable; moderately acid; clear smooth boundary.

Bt—15 to 28 inches; dark yellowish brown (10YR 4/4) loam; few fine faint yellowish brown (10YR 5/6) iron concentrations; moderate medium subangular blocky structure; friable; many thin brown and dark brown (10YR 4/3) clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

2C—28 to 60 inches; stratified light yellowish brown (10YR 6/4) very fine sandy loam and pale brown (10YR 6/3) fine sand; weak medium platy soil aggregates; very friable; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 48 inches
Content of rock fragments: 0 to 3 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—fine sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—very fine sand, loamy fine sand, or fine sandy loam

Bt horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—fine sandy loam, sandy loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—stratified fine sand, sand, loamy fine sand, silt loam, very fine sand, and very fine sandy loam

503B—Balmlake fine sandy loam, 1 to 8 percent slopes

Composition

Balmlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rises on moraines
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Dalbo and similar soils
- Rosy and similar soils
- Hillview and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

503C—Balmlake fine sandy loam, 8 to 15 percent slopes

Composition

Balmlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Dalbo and similar soils
- Rosy and similar soils
- Hillview and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

503E—Balmlake fine sandy loam, 15 to 30 percent slopes

Composition

Balmlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Dalbo and similar soils
- Rosy and similar soils
- Hillview and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Barnes Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic class: Fine-loamy, mixed Udic Haploborolls

Typical Pedon

Barnes loam, in an area of Barnes-Langhei complex, 6 to 12 percent slopes, eroded, 2,400 feet east and 400 feet south of the northwest corner of sec. 9, T. 142 N., R. 41 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; neutral; abrupt smooth boundary.

Bw—8 to 19 inches; dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; about 3 percent gravel; neutral; clear smooth boundary.

Bk—19 to 33 inches; pale brown (10YR 6/3) loam; weak fine subangular blocky structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

C—33 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; about 5 percent gravel; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 10 percent
Depth to carbonates: 0 to 20 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—3 or 4
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—loam

33B—Barnes loam, 2 to 6 percent slopes

Composition

Barnes and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Rises on moraines
Slope range: 2 to 6 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

903B—Barnes-Langhei complex, 2 to 6 percent slopes

Composition

Barnes and similar soils: About 65 percent
Langhei and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Barnes—2 to 6 percent; Langhei—3 to 6 percent

Component Description

Barnes
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderate

Langhei
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Vallers and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

903C2—Barnes-Langhei complex, 6 to 12 percent slopes, eroded

Composition

Barnes and similar soils: About 55 percent
Langhei and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines

Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Barnes
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Moderate

Langhei
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Vallers and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Beltrami Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate or moderately rapid; next part—moderately slow or moderate; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 3 percent
Taxonomic class: Fine-loamy, mixed Aquic Eutroboralfs

Typical Pedon

Beltrami loam, 500 feet east and 100 feet south of the northwest corner of sec. 9, T. 141 N., R. 40 W.

A—0 to 4 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; about 2 percent gravel; neutral; clear smooth boundary.

E—4 to 8 inches; dark gray (10YR 4/1) sandy loam, light gray (10YR 7/2) dry; weak thin platy structure; very friable; about 2 percent gravel; neutral; clear smooth boundary.

Bt—8 to 22 inches; olive brown (2.5Y 4/4) clay loam; moderate medium subangular blocky structure; friable; few fine faint light brownish gray (2.5Y 6/2) iron depletions; many thick very dark gray (10YR 3/1) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear smooth boundary.

Bk—22 to 43 inches; light olive brown (2.5Y 5/4) loam; weak medium subangular blocky structure; friable; few fine distinct gray (10YR 6/1) iron depletions and yellowish brown (10YR 5/6) iron concentrations; about 5 percent gravel; many light gray (10YR 7/2) filaments and threads of segregated lime; violently effervescent; slightly alkaline; gradual smooth boundary.

C—43 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; common medium distinct gray (10YR 6/1) iron depletions and dark yellowish brown (10YR 5/6) iron concentrations; about 6 percent gravel; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 or 2
Texture—loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—fine sandy loam, sandy loam, or loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4

Texture—clay loam or sandy clay loam

Bk and C horizons:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or clay loam

125—Beltrami loam

Composition

Beltrami and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nebish and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Birchlake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately slow; lower part—slow
Landform: Moraines
Parent material: Till
Slope range: 1 to 30 percent
Taxonomic class: Fine, montmorillonitic Aquic Argiborolls

Typical Pedon

Birchlake silty clay loam, 1 to 6 percent slopes, 1,800 feet east and 1,100 feet south of the northwest corner of sec. 33, T. 140 N., R. 41 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; about 1 percent gravel; neutral; abrupt smooth boundary.

Bt—8 to 22 inches; dark yellowish brown (10YR 3/4) clay; strong medium angular blocky structure; friable; many thick very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 2 percent gravel; neutral; clear smooth boundary.

Btk—22 to 27 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine distinct yellowish brown (10YR 5/6) iron concentrations; few thin dark brown (10YR 3/3) clay films on faces of peds; about 2 percent gravel; strongly effervescent with lime disseminated in ped interiors; slightly alkaline; clear wavy boundary.

Bk—27 to 40 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine distinct light brownish gray (2.5Y 6/2) iron depletions and common fine faint light olive brown (2.5Y 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—40 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate fine subangular blocky soil aggregates; friable; common medium distinct light gray (2.5Y 6/2) iron depletions and common fine faint light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 12 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 4 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3

Chroma—1
Texture—silty clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 to 4
Texture—clay, silty clay, or silty clay loam

Bk and C horizons:
Hue—2.5Y or 10YR
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam or clay loam

1137B—Birchlake silty clay loam, 1 to 6 percent slopes

Composition

Birchlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rises on moraines
Slope range: 1 to 6 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boyerlake and similar soils
- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1137C—Birchlake silty clay loam, 6 to 12 percent slopes, eroded

Composition

Birchlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boyerlake and similar soils
- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1137D—Birchlake silty clay loam, 12 to 20 percent slopes, eroded

Composition

Birchlake and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boyerlake and similar soils
- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1137E—Birchlake silty clay loam, 20 to 30 percent slopes

Composition

Birchlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 20 to 30 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 13.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boyerlake and similar soils
- Foxlake and similar soils
- Lakepark and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Blowers Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 1 to 5 percent
Taxonomic class: Coarse-loamy, mixed Glossaquic Eutroboralfs

Typical Pedon

Blowers sandy loam, 1 to 5 percent slopes, stony, 1,500 feet south and 200 feet west of the northeast corner of sec. 27, T. 138 N., R. 36 W.

A—0 to 3 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; about 8 percent gravel; neutral; abrupt smooth boundary.

E—3 to 14 inches; brown (10YR 5/3) sandy loam, light gray (10YR 7/2) dry; weak thin platy structure;

friable; about 8 percent gravel; neutral; clear smooth boundary.

B/E—14 to 22 inches; about 80 percent dark yellowish brown (10YR 4/4) sandy loam (Bt) and 20 percent brown (10YR 5/3) sandy loam (E); weak medium subangular blocky structure; friable; common medium prominent light brownish gray (2.5Y 6/2) iron depletions and yellowish brown (10YR 5/6) iron concentrations; about 8 percent gravel; slightly acid; clear smooth boundary.

Bt—22 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common medium distinct strong brown (7.5YR 4/6) iron concentrations and few fine prominent light brownish gray (2.5Y 6/2) iron depletions; many thin dark brown (10YR 3/3) clay films on faces of peds and in pores; about 6 percent gravel; slightly acid; clear smooth boundary.

BC—32 to 47 inches; light yellowish brown (10YR 6/4) sandy loam; weak medium platy soil aggregates; friable; few light gray (10YR 7/2) filaments and threads of segregated lime; about 6 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cd—47 to 60 inches; light yellowish brown (10YR 6/4) sandy loam; weak medium platy soil aggregates; firm; few light gray (10YR 7/2) filaments and threads of segregated lime; about 6 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 32 to 60 inches
Depth to dense till: 40 to 60 inches
Content of rock fragments: 2 to 15 percent

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam or loamy sand

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—3 to 6
Texture—sandy loam or sandy clay loam

Cd horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 5
Texture—sandy loam

1320B—Blowers sandy loam, 1 to 5 percent slopes, stony

Composition

Blowers and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Back slopes and shoulders
Slope range: 1 to 5 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.0 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rockwood and similar soils
- Rosy and similar soils
- Paddock and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Bootlake Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid or rapid;

next part—moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 0 to 15 percent
Taxonomic class: Coarse-loamy, mixed Typic Eutroboralfs

Typical Pedon

Bootlake sandy loam (fig. I-8), in an area of Bootlake-Graycalm complex, 0 to 2 percent slopes, 1,200 feet west and 1,700 feet south of the northeast corner of sec. 9, T. 139 N., R. 36 W.

A—0 to 3 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; about 2 percent gravel; slightly acid; clear smooth boundary.

E—3 to 7 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak thin platy structure; very friable; about 2 percent gravel; slightly acid; clear smooth boundary.

Bt—7 to 13 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; many thin dark brown (10YR 4/3) clay films on faces of peds; about 2 percent gravel; slightly acid; clear smooth boundary.

Bw—13 to 47 inches; dark yellowish brown (10YR 4/6) coarse sand; single grain; loose; about 8 percent gravel; slightly acid; clear smooth boundary.

C—47 to 60 inches; pale brown (10YR 6/3) coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 8 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 7 percent gravel

E horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam, coarse sandy loam, loamy sand, or loamy coarse sand
Content of rock fragments—0 to 7 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—3 or 4
Texture—sandy loam, coarse sandy loam, or sandy clay loam in the upper part; loamy sand or loamy coarse sand in the lower part
Content of rock fragments—0 to 7 percent gravel

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—sand or coarse sand
Content of rock fragments—0 to 15 percent gravel

C horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand or coarse sand
Content of rock fragments—0 to 15 percent gravel

315A—Bootlake sandy loam, 0 to 2 percent slopes

Composition

Bootlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

315B—Bootlake sandy loam, 2 to 5 percent slopes

Composition

Bootlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 5 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1127A—Bootlake-Graycalm complex, 0 to 2 percent slopes

Composition

Bootlake and similar soils: About 50 percent
Graycalm and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Bootlake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderately low

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Friendship and similar soils
- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

• Forest Land section

1127B—Bootlake-Graycalm complex, 2 to 8 percent slopes

Composition

Bootlake and similar soils: About 50 percent
Graycalm and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Bootlake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Friendship and similar soils
• Karlstad and similar soils
• Epoufette and similar soils
• The depressional Forada soils and similar soils
• Nidaros and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

1252B—Bootlake-Eagleview complex, 1 to 8 percent slopes

Composition

Bootlake and similar soils: About 50 percent
Eagleview and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Bootlake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.0 inches
Organic matter content: Moderately low

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Friendship and similar soils
• Karlstad and similar soils
• Epoufette and similar soils
• Meehan and similar soils
• The depressional Forada soils and similar soils
• Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Boyerlake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Moraines
Parent material: Till
Slope range: 3 to 30 percent
Taxonomic class: Fine, montmorillonitic, frigid Vertic Eutrochrepts

Typical Pedon

Boyerlake silty clay loam, in an area of Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded, 800 feet east and 2,600 feet north of the southwest corner of sec. 3, T. 139 N., R. 43 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; friable; about 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—7 to 17 inches; light olive brown (2.5Y 5/3) silty clay loam; moderate medium angular blocky structure; friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk2—17 to 37 inches; light olive brown (2.5Y 5/3) silty clay loam; moderate medium angular blocky structure; friable; common medium distinct grayish brown (2.5Y 5/2) iron depletions and few fine distinct yellowish brown (10YR 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—37 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium angular blocky soil aggregates; friable; many coarse distinct yellowish brown (10YR 5/4) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: Occurring throughout the profile
Content of rock fragments: 1 to 4 percent

Ap horizon:
Hue—10YR
Value—3 to 5 moist; 6 or 7 dry
Chroma—2 or 3
Texture—silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam, clay loam, or silty clay

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam, clay loam, or silty clay

Buse Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Till
Slope range: 3 to 6 percent
Taxonomic class: Fine-loamy, mixed Typic Calciborolls

Typical Pedon

Buse clay loam, in an area of Formdale-Buse complex, 2 to 6 percent slopes, 600 feet west and 100 feet north of the southeast corner of sec. 8, T. 141 N., R. 41 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 3 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—7 to 15 inches; light yellowish brown (10YR 6/4) clay loam; weak fine subangular blocky structure; friable; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—15 to 35 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly

effervescent; moderately alkaline; gradual smooth boundary.

C—35 to 60 inches; light olive brown (2.5Y 5/4) loam; few medium distinct grayish brown (2.5Y 5/2) iron depletions (relict); massive; friable; few medium distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: Typically occurring throughout the profile
Thickness of the mollic epipedon: 7 to 10 inches
Content of rock fragments: 2 to 12 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—loam or clay loam

Bygland Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately slow; next part—slow or moderately slow; lower part—moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 1 to 15 percent
Taxonomic class: Fine, montmorillonitic Aquertic Argiborolls

Typical Pedon

Bygland silty clay loam, 1 to 6 percent slopes, 500 feet east and 2,000 feet south of the northwest corner of sec. 6, T. 138 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (N 3/0) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—8 to 11 inches; very dark grayish brown (10YR 3/2) silty clay; moderate medium subangular blocky structure; friable; many thin black (N 2/0) clay films on faces of peds and in pores; neutral; gradual wavy boundary.

Bt2—11 to 22 inches; olive brown (2.5Y 4/3) silty clay; moderate medium subangular blocky structure; friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; many thick very dark gray (10YR 3/1) clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bk—22 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium subangular blocky structure; friable; few fine distinct light olive brown (2.5Y 5/6) iron concentrations; many white (10YR 8/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline; gradual wavy boundary.

C—38 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium platy soil aggregates; friable; few fine distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 16 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—2 to 4
Texture—silty clay, clay, or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 5
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam or silt loam

422B—Bygland silty clay loam, 1 to 6 percent slopes

Composition

Bygland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rises on moraines
Slope range: 1 to 6 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindaas and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

422C—Bygland silty clay loam, 6 to 15 percent slopes

Composition

Bygland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 15 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindaas and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Cathro Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderately slow to moderately rapid; lower part—moderately slow or moderate
Landform: Moraines, drumlins, and flood plains
Parent material: Organic materials and glaciolacustrine deposits or till
Slope range: 0 to 1 percent
Taxonomic class: Loamy, mixed, euic Terric Borosaprists

Typical Pedon

Cathro muck, 1,700 feet west and 300 feet south of the northeast corner of sec. 24, T. 142 N., R. 43 W.

Oap—0 to 8 inches; black (10YR 2/1) muck; about 40 percent fiber, 1 percent rubbed; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

Oa—8 to 22 inches; black (10YR 2/1) muck; about 40 percent fiber, 2 percent rubbed; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

A—22 to 33 inches; black (5Y 2.5/1) silty clay loam, very dark gray (5Y 3/1) dry; weak medium

subangular blocky structure; friable; neutral; clear smooth boundary.

Cg1—33 to 49 inches; grayish brown (5Y 5/2) clay loam; weak medium subangular blocky soil aggregates; common medium prominent yellowish brown (10YR 4/6) iron concentrations; friable; about 4 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—49 to 60 inches; gray (5Y 5/1) clay loam; massive; friable; many coarse prominent dark yellowish brown (10YR 5/6) iron concentrations; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Fiber content: 10 to 50 percent unrubbed; less than 16 percent rubbed
Content of wood fragments: Less than 15 percent

Oa or Oap horizon:
Hue—5YR, 7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—muck

A horizon:
Hue—2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam, clay loam, silt loam, or silty clay loam
Content of rock fragments—0 to 10 percent

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—loam, clay loam, silt loam, silty clay loam, sandy loam, or fine sandy loam
Content of rock fragments—0 to 10 percent

544—Cathro muck

Composition

Cathro and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 15.9 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Winger and similar soils
- Smiley and similar soils
- Egglake and similar soils
- Paddock and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1128—Cathro muck, frequently flooded

Composition

Cathro and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: Frequent
Seasonal high water table: 1 foot above to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 15.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lamoure and similar soils
- Vallers and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Chapett Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic class: Fine-loamy, mixed Boralfic Udic Argiborolls

Typical Pedon

Chapett fine sandy loam, 2 to 8 percent slopes, 1,500 feet west and 900 feet south of the northeast corner of sec. 4, T. 138 N., R. 42 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; about 5 percent gravel; neutral; abrupt smooth boundary.

E—8 to 9 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; very friable; about 5 percent gravel; neutral; clear smooth boundary.

Bt1—9 to 15 inches; dark brown (10YR 4/3) sandy clay loam; moderate medium subangular blocky structure; friable; many thin brown (10YR 5/3) sand and silt coatings on faces of peds and in pores; about 5 percent gravel; neutral; gradual smooth boundary.

Bt2—15 to 23 inches; dark brown (10YR 4/3) sandy clay loam; moderate medium subangular blocky structure; friable; many thin dark brown (10YR 3/3) clay films on faces of peds; about 5 percent gravel; neutral; clear smooth boundary.

Bk—23 to 33 inches; light yellowish brown (2.5Y 6/4) sandy loam; weak medium platy structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—33 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; weak medium platy soil aggregates; very friable; few light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to the base of the argillic horizon: 14 to 28 inches
Content of rock fragments: 2 to 10 percent
Depth to carbonates: 14 to 28 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, or loamy sand

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—sandy clay loam, sandy loam, fine sandy loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

20B—Chapett fine sandy loam, 2 to 8 percent slopes

Composition

Chapett and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

20C2—Chapett fine sandy loam, 8 to 15 percent slopes, eroded

Composition

Chapett and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

20E—Chapett fine sandy loam, 15 to 30 percent slopes

Composition

Chapett and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Lakepark and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Colvin Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 0 to 1 percent
Taxonomic class: Fine-silty, frigid Typic Calciaquolls

Typical Pedon

Colvin silty clay loam, 1,700 feet west and 2,600 feet south of the northeast corner of sec. 2, T. 141 N., R. 42 W.

A—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; strongly effervescent; moderately alkaline; clear smooth boundary.

Bkg1—10 to 14 inches; dark gray (5Y 4/1) silt loam, gray (5Y 6/1) dry; weak fine subangular blocky structure; friable; violently effervescent with lime disseminated throughout; moderately alkaline; clear smooth boundary.

Bkg2—14 to 26 inches; light olive gray (5Y 6/2) silt loam; weak fine subangular blocky structure; friable; few fine distinct olive yellow (2.5Y 6/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Cg1—26 to 43 inches; light olive gray (5Y 6/2) silt loam; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—43 to 60 inches; light olive gray (5Y 6/2) silt loam; massive; friable; few medium distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches

Carbonates: Occurring throughout the profile

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7
Chroma—0 to 2
Texture—silt loam or silty clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—3 to 6
Chroma—1 to 4
Texture—silt loam or silty clay loam

47—Colvin silty clay loam

Composition

Colvin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- McIntosh and similar soils
- The depressional Colvin soils and similar soils
- Hamre and similar soils
- Quam and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

351—Colvin silty clay loam, depressional

Composition

Colvin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- McIntosh and similar soils
- Winger and similar soils
- Rockwell and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Corliss Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Moraines, outwash plains, and valley trains
Parent material: Glacial outwash
Slope range: 1 to 35 percent
Taxonomic class: Mixed, frigid Typic Udipsamments

Typical Pedon

Corliss loamy sand, 20 to 35 percent slopes, 600 feet south and 50 feet east of the northwest corner of sec. 32, T. 138 N., T. 42 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loamy sand, very dark gray (10YR 4/1) dry; weak fine granular structure; very friable; about 5 percent gravel; neutral; abrupt smooth boundary.

Bw—7 to 9 inches; dark brown (10YR 4/3) gravelly loamy coarse sand; single grain; loose; about 20 percent gravel; neutral; clear smooth boundary.

C—9 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 40 inches

A or Ap horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand
Content of rock fragments—3 to 25 percent gravel

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—sand, coarse sand, loamy sand, loamy coarse sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

721E—Corliss loamy sand, 20 to 35 percent slopes

Composition

Corliss and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 20 to 35 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Arvilla and similar soils
- Fordville and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1247D—Corliss-Dorset complex, 12 to 20 percent slopes

Composition

Corliss and similar soils: About 65 percent
Dorset and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Corliss
Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

Dorset
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Dalbo Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; next part—slow or moderately slow; lower part—moderately slow or moderate
Landform: Moraines and outwash plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 30 percent
Taxonomic class: Fine, montmorillonitic Vertic Eutroboralfs

Typical Pedon

Dalbo silt loam, 0 to 2 percent slopes, 1,800 feet south and 200 feet east of the northwest corner of sec. 4, T. 142 N., R. 38 W.

A—0 to 2 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

E—2 to 6 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate thin platy structure; friable; neutral; clear wavy boundary.

Bt1—6 to 15 inches; dark brown (10YR 4/3) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many thin dark brown (10YR 3/3) clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bt2—15 to 22 inches; dark brown (10YR 4/3) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine faint dark grayish brown (2.5Y 4/2) iron depletions; many thin dark brown (10YR 3/3) clay films on faces of peds and in pores; neutral; gradual wavy boundary.

BC—22 to 41 inches; olive brown (2.5Y 4/4) silty clay loam; moderate thin platy structure; friable; few medium distinct grayish brown (2.5Y 5/2) iron depletions and common medium distinct dark yellowish brown (10YR 4/6) iron concentrations; slightly acid; clear wavy boundary.

C—41 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam; moderate medium platy soil aggregates; friable; common medium faint light brownish gray (2.5Y 6/2) iron depletions and common medium distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to 42 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam, loam, silty clay loam, very fine sandy loam, or fine sandy loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam, silty clay, or clay

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam, silty clay, or silt loam

133A—Dalbo silt loam, 0 to 2 percent slopes

Composition

Dalbo and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on moraines and outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Friendship and similar soils
- Rosy and similar soils
- Lindaas and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

133B—Dalbo silt loam, 2 to 8 percent slopes

Composition

Dalbo and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Graycalm and similar soils
- Balmlake and similar soils
- Lindaas and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

133C—Dalbo silt loam, 8 to 15 percent slopes

Composition

Dalbo and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Graycalm and similar soils
- Balmlake and similar soils
- Lindaas and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

133E—Dalbo silt loam, 15 to 30 percent slopes

Composition

Dalbo and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits

Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Graycalm and similar soils
- Balmlake and similar soils
- Lindaas and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Darnen Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Outwash plains and valley trains
Parent material: Colluvium
Slope range: 0 to 3 percent
Taxonomic class: Fine-loamy, mixed Pachic Udic Haploborolls

Typical Pedon

Darnen loam, 400 feet east and 350 feet south of the northwest corner of sec. 19, T. 138 N., R. 41 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; neutral; abrupt smooth boundary.

A1—10 to 38 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; about 2 percent gravel; neutral; clear smooth boundary.

A2—38 to 56 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; about 1 percent gravel; neutral; gradual smooth boundary.

Bw—56 to 60 inches; dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure; friable; about 1 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 20 to 60 inches
Thickness of the mollic epipedon: 24 to 48 inches
Content of rock fragments: 0 to 5 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

B horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loam or clay loam

1318—Darnen loam

Composition

Darnen and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Swales on outwash plains and valley trains
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Arvilla and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section

Dorset Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Moraines, outwash plains, and valley trains
Parent material: Glacial outwash
Slope range: 0 to 20 percent
Taxonomic class: Coarse-loamy, mixed Udic Argiborolls

Typical Pedon

Dorset sandy loam, 2 to 6 percent slopes (fig. I-9), 2,200 feet east and 500 feet north of the southwest corner of sec. 26, T. 141 N., R. 38 W.

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 5 percent gravel; moderately acid; abrupt smooth boundary.

Bt—10 to 17 inches; dark brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; many thin very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 5 percent gravel; neutral; clear smooth boundary.

2BC—17 to 29 inches; dark yellowish brown (10YR 4/4) gravelly coarse sand; single grain; loose; about 30 percent gravel; neutral; clear smooth boundary.

2C—29 to 60 inches; light yellowish brown (10YR 6/4) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 25 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 36 inches
Thickness of the mollic epipedon: 7 to 11 inches
Thickness of the loamy mantle: 12 to 24 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 10 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—loam or sandy loam
Content of rock fragments—0 to 10 percent gravel

2C horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—gravelly coarse sand, gravelly sand, sand, or coarse sand
Content of rock fragments—10 to 35 percent gravel

406A—Dorset sandy loam, 0 to 2 percent slopes

Composition

Dorset and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Two Inlets and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

406B—Dorset sandy loam, 2 to 6 percent slopes

Composition

Dorset and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 6 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Two Inlets and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

778B—Dorset-Corliss complex, 1 to 6 percent slopes

Composition

Dorset and similar soils: About 70 percent
Corliss and similar soils: About 25 percent
Inclusions: About 5 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 6 percent

Component Description

Dorset
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: High

Corliss
Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

778C—Dorset-Corliss complex, 6 to 12 percent slopes

Composition

Dorset and similar soils: About 50 percent
Corliss and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Dorset
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: High

Corliss
Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Dovray Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—slow or moderately slow; lower part—slow
Landform: Moraines
Parent material: Colluvium and till
Slope range: 0 to 1 percent
Taxonomic class: Fine, montmorillonitic, frigid Cumulic Vertic Epiaquolls

Typical Pedon

Dovray silty clay, 2,200 feet west and 1,800 feet south of the northeast corner of sec. 14, T. 139 N., R. 42 W.

Ap—0 to 10 inches; black (N 2/0) silty clay, very dark gray (N 3/0) dry; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—10 to 29 inches; black (N 2/0) silty clay, dark gray (N 3/0) dry; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A2—29 to 43 inches; black (5Y 2/1) silty clay, dark gray (5Y 4/1) dry; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

Bkg—43 to 54 inches; olive gray (5Y 5/2) silty clay; weak fine subangular blocky structure; friable; common fine distinct light olive brown (2.5Y 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg—54 to 60 inches; gray (5Y 5/1) silty clay; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 1 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 60 inches
Thickness of the mollic epipedon: 24 to 54 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay

Bg horizon:
Hue—2.5Y or 5Y
Value—3 to 6

Chroma—1 or 2
Texture—silty clay or silty clay loam
Content of rock fragments—0 to 5 percent

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay, silty clay loam, or clay loam
Content of rock fragments—0 to 5 percent

137—Dovray silty clay

Composition

Dovray and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Colluvium and till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Audubon and similar soils
- Foxlake and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Eagleview Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Outwash plains, valley trains, and moraines
Parent material: Glacial outwash
Slope range: 1 to 30 percent
Taxonomic class: Mixed, frigid Argic Udipsamments

Typical Pedon

Eagleview loamy sand (fig. I-10), in an area of Eagleview-Balmlake complex, 8 to 15 percent slopes, 400 feet south and 1,000 feet west of the northeast corner of sec. 16, T. 140 N., R. 40 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; about 1 percent gravel; neutral; abrupt smooth boundary.

E—7 to 16 inches; brown (10YR 5/3) sand, light brownish gray (10YR 6/2) dry; single grain; loose; about 1 percent gravel; neutral; clear wavy boundary.

Bw—16 to 23 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 1 percent gravel; neutral; abrupt smooth boundary.

E and Bt1—23 to 33 inches; dark yellowish brown (10YR 4/6) sand (E); single grain; loose; lamellae of dark brown (7.5YR 4/4) sandy loam (Bt) ½ inch thick at depths of 23 inches and 32 inches; weak medium subangular blocky structure; friable; common thin clay coatings on sand grains and clay bridging between sand grains; about 1 percent gravel; neutral; abrupt smooth boundary.

E and Bt2—33 to 37 inches; yellowish brown (10YR 5/4) sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/4) loamy sand (Bt) 1 inch thick at a depth of 36 inches; weak fine subangular blocky structure; common thin clay coatings on sand grains and clay bridging between sand grains; about 1 percent gravel; neutral; clear smooth boundary.

C2—37 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 1 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Content of rock fragments: 0 to 10 percent gravel
Depth to carbonates: 25 to 50 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand

E horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—sand, coarse sand, loamy sand, or loamy coarse sand

Bw horizon:
Hue—10YR
Value—4 to 6
Chroma—3 or 4
Texture—sand or coarse sand

E part of the E and Bt horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand or coarse sand

Bt part of the E and Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, sandy loam, or coarse sandy loam

C horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand or coarse sand

1132B—Eagleview-Balmlake complex, 1 to 8 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Balmlake and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Moderately low

Balmlake
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Snellman and similar soils
- Rosy and similar soils
- Friendship and similar soils
- Hillview and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1132C—Eagleview-Balmlake complex, 8 to 15 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Balmlake and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderately low

Balmlake
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Snellman and similar soils
- Rosy and similar soils
- Friendship and similar soils
- Hillview and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1132E—Eagleview-Balmlake complex, 15 to 30 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Balmlake and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: Moderately low

Balmlake
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Snellman and similar soils
- Rosy and similar soils
- Friendship and similar soils
- Hillview and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1140B—Eagleview-Snellman complex, 1 to 8 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Snellman and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Eagleview—1 to 8 percent; Snellman—2 to 8 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: Moderately low

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Wykeham and similar soils
- Friendship and similar soils
- Egglake and similar soils
- Meehan and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1140C—Eagleview-Snellman complex, 8 to 15 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Snellman and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: Moderately low

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Wykeham and similar soils
- Friendship and similar soils
- Egglake and similar soils
- Meehan and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1236B—Eagleview loamy sand, 1 to 8 percent slopes

Composition

Eagleview and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1236C—Eagleview loamy sand, 8 to 15 percent slopes

Composition

Eagleview and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1236E—Eagleview loamy sand, 15 to 30 percent slopes

Composition

Eagleview and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1263C—Eagleview-Bootlake complex, 8 to 15 percent slopes

Composition

Eagleview and similar soils: About 50 percent
Bootlake and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: Moderately low

Bootlake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Friendship and similar soils
- Karlstad and similar soils
- Epoufette and similar soils
- Meehan and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Egeland Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—moderate
Landform: Moraines

Parent material: Glaciolacustrine deposits
Slope range: 1 to 12 percent
Taxonomic class: Coarse-loamy, mixed Udic Haploborolls

Typical Pedon

Egeland fine sandy loam, 6 to 12 percent slopes, 1,600 feet west and 100 feet north of the southeast corner of sec. 31, T. 142 N., R. 41 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

Bw1—8 to 13 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine subangular blocky structure; very friable; neutral; gradual smooth boundary.

Bw2—13 to 22 inches; dark brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bk—22 to 35 inches; yellowish brown (10YR 5/4) loamy fine sand; weak very fine subangular blocky structure; very friable; many light gray (10YR 7/2) filaments and threads of segregated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C—35 to 60 inches; stratified yellowish brown (10YR 5/4) fine sandy loam, light yellowish brown (10YR 6/4) fine sand, and light yellowish brown (2.5Y 6/4) silt loam; massive; very friable and loose; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 14 to 45 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 0 to 10 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—fine sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 to 4
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, loamy very fine sand, sandy loam, or fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, loamy very fine sand, sandy loam, fine sandy loam, very fine sandy loam, or silt loam

141B—Egeland fine sandy loam, 1 to 6 percent slopes

Composition

Egeland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 1 to 6 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sverdrup and similar soils
- Barnes and similar soils
- Wyndmere and similar soils
- Rockwell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

141C—Egeland fine sandy loam, 6 to 12 percent slopes

Composition

Egeland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sverdrup and similar soils
- Barnes and similar soils
- Wyndmere and similar soils
- Rockwell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Egglake Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Egglake loam, in an area of Egglake-Cathro complex, 2,600 feet south and 1,600 feet west of the northeast corner of sec. 2, T. 139 N., R. 38 W.

A—0 to 4 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; about 5 percent gravel and 1 percent cobbles and stones; neutral; clear smooth boundary.

E—4 to 9 inches; grayish brown (2.5Y 5/2) fine sandy loam, gray (10YR 6/1) dry; weak medium platy structure parting to weak fine subangular blocky; very friable; about 7 percent gravel and 1 percent cobbles and stones; neutral; clear smooth boundary.

Btg—9 to 25 inches; grayish brown (2.5Y 5/2) sandy clay loam; weak fine subangular blocky structure; friable; common fine prominent dark reddish brown (5YR 3/4) iron concentrations; few thin very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 7 percent gravel and 1 percent cobbles and stones; neutral; gradual smooth boundary.

Bg—25 to 34 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium subangular blocky structure; very friable; common fine distinct yellowish brown (10YR 5/6) iron concentrations; about 8 percent gravel and 2 percent cobbles and stones; neutral; clear smooth boundary.

Bkg—34 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam; weak medium platy soil aggregates; very friable; common medium distinct light olive gray (5Y 6/2) iron depletions and few fine distinct yellowish brown (10YR 5/6) iron concentrations; common light gray (10YR 7/2) filaments and threads of segregated lime; about 8 percent gravel and 2 percent cobbles and stones; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam

E horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—fine sandy loam or sandy loam

Bt horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—sandy clay loam, sandy loam, or loam

Bg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam or coarse sandy loam

Bkg or Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—sandy loam or coarse sandy loam

1200—Egglake loam

Composition

Egglake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Wykeham and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1211—Egglake-Cathro complex

Composition

Egglake and similar soils: About 65 percent
Cathro and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Egglake—drainageways and flats on moraines; Cathro—depressions on moraines
Slope range: Egglake—0 to 2 percent; Cathro—0 to 1 percent

Component Description

Egglake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Cathro
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 15.6 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Wykeham and similar soils
- Hillview and similar soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Epoufette Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid or rapid; lower part—very rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Epoufette sandy loam, 1,900 feet south and 400 feet west of the northeast corner of sec. 26, T. 139 N., R. 38 W.

Ap—0 to 6 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 3 percent gravel; neutral; abrupt smooth boundary.

Eg—6 to 12 inches; grayish brown (2.5Y 5/2) loamy sand, light gray (2.5Y 7/2) dry; weak thin platy structure; very friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; about 5 percent gravel; neutral; clear smooth boundary.

Btg—12 to 20 inches; dark grayish brown (2.5Y 4/2) sandy loam; moderate medium subangular blocky structure; friable; common medium distinct dark yellowish brown (10YR 4/6) iron concentrations; few thin very dark grayish brown (2.5Y 3/2) clay films on faces of peds; about 5 percent gravel; neutral; gradual smooth boundary.

Bg—20 to 29 inches; grayish brown (2.5Y 5/2) loamy coarse sand; weak fine subangular blocky structure; very friable; common medium distinct yellowish brown (10YR 5/6) iron concentrations; about 10 percent gravel; neutral; clear smooth boundary.

2Cg—29 to 60 inches; light brownish gray (2.5Y 6/2) gravelly coarse sand; single grain; few medium distinct yellowish brown (10YR 5/6) iron concentrations; loose; few carbonate coatings on the underside of pebbles; about 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 40 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent gravel

Eg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—sand, loamy sand, loamy coarse sand, gravelly sand, or gravelly loamy sand
Content of rock fragments—5 to 25 percent gravel

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—gravelly sandy loam, coarse sandy loam, or sandy loam
Content of rock fragments—5 to 25 percent gravel

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent gravel

191—Epoufette sandy loam

Composition

Epoufette and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 2.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sugarbush and similar soils
- Karlstad and similar soils
- Friendship and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Flom Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Flom silty clay loam, 2,300 feet west and 2,100 feet north of the southeast corner of sec. 8, T. 139 N., R. 43 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—10 to 16 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bg—16 to 24 inches; olive gray (5Y 5/2) silty clay loam; weak medium subangular blocky structure; friable; few fine distinct light olive brown (2.5Y 5/6) iron concentrations; about 2 percent gravel; slightly alkaline; clear smooth boundary.

Bkg—24 to 36 inches; light olive gray (5Y 6/2) clay loam; weak fine subangular blocky structure; friable; common fine distinct light olive brown (2.5Y 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

Cg—36 to 60 inches; light olive gray (5Y 6/2) clay loam; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; few white (10YR 8/2) filaments and threads of segregated lime; about 3 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 48 inches
Thickness of the mollic epipedon: 10 to 24 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam, silty clay loam, or loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 or 3
Texture—clay loam or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 to 4
Texture—clay loam or loam

36—Flom silty clay loam

Composition

Flom and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit,

such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Formdale and similar soils
- Aazdahl and similar soils
- Quam and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Forada Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Forada loam, 1,300 feet east and 1,700 feet south of the northwest corner of sec. 23, T. 139 N., R. 41 W.

Ap—0 to 7 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; weak fine subangular blocky structure parting to weak fine granular; friable; about 2 percent gravel; moderately acid; abrupt smooth boundary.

A—7 to 14 inches; very dark gray (N 3/0) sandy loam, dark gray (N 4/0) dry; weak fine subangular blocky structure; friable; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bg—14 to 22 inches; dark grayish brown (2.5Y 4/2) sandy loam; weak fine subangular blocky structure; friable; common fine distinct light brownish gray (10YR 6/2) iron depletions and few fine prominent strong brown (7.5YR 5/6) iron concentrations; about 5 percent gravel; slightly acid; gradual smooth boundary.

2BCg—22 to 40 inches; light brownish gray (2.5Y 6/2) coarse sand; single grain; loose; about 10 percent gravel; neutral; clear smooth boundary.

2Cg—40 to 60 inches; light brownish gray (2.5Y 6/2) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 15 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the loamy mantle: 20 to 40 inches
Depth to carbonates: 20 to 50 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam or mucky loam
Content of rock fragments—0 to 10 percent gravel

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or loam
Content of rock fragments—0 to 10 percent gravel

2Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent gravel

375—Forada loam

Composition

Forada and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 6.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the

"Soil Properties" section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Verndale and similar soils
- Osakis and similar soils
- Oylen and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1942—Forada mucky loam, depressional

Composition

Forada and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Mucky loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forada and similar soils
- Hangaard and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Fordville Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid or very rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic class: Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls

Typical Pedon

Fordville loam, 1,900 feet east and 150 feet north of the southwest corner of sec. 30, T. 138 N., R. 42 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 3 percent gravel; slightly acid; abrupt smooth boundary.

A—10 to 17 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; about 3 percent gravel; slightly acid; clear smooth boundary.

Bw—17 to 28 inches; dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; about 4 percent gravel; slightly acid; clear smooth boundary.

2BC—28 to 36 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 7 percent gravel; neutral; clear smooth boundary.

2C—36 to 60 inches; light yellowish brown (10YR 6/4) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Thickness of the loamy mantle: 20 to 40 inches
Depth to carbonates: 20 to 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Content of rock fragments—0 to 3 percent gravel

Bw horizon:
Hue—10YR
Value—2 to 4
Chroma—2 to 4

Texture—loam, silt loam, or clay loam
Content of rock fragments—0 to 7 percent

BC horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 or 3
Texture—sand or coarse sand
Content of rock fragments—0 to 15 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 4
Texture—gravelly sand or gravelly coarse sand
Content of rock fragments—15 to 35 percent gravel

339—Fordville loam

Composition

Fordville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Swales on outwash plains and valley trains
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Darnen and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Forman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic class: Fine-loamy, mixed Udic Argiborolls

Typical Pedon

Forman clay loam, 2 to 6 percent slopes, 300 feet west and 2,000 feet south of the northeast corner of sec. 2, T. 142 N., R. 41 W.

Ap—0 to 8 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; neutral; abrupt smooth boundary.

Bt—8 to 15 inches; dark brown (10YR 4/3) clay loam; moderate medium angular blocky structure; friable; many thin dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear wavy boundary.

Bk—15 to 32 inches; brown (10YR 5/3) clay loam; weak medium subangular blocky structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—32 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; few medium distinct light brownish gray (2.5Y 6/2) iron depletions and few fine distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 4 percent gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 2 to 10 percent
Depth to carbonates: 12 to 30 inches

Ap or A horizon:
Hue—10YR
Value—2
Chroma—1
Texture—clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 to 3
Texture—clay loam or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y

Value—4 to 6
Chroma—3 or 4
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—clay loam or loam

168B—Forman clay loam, 2 to 6 percent slopes

Composition

Forman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 6 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Gonvick and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

168C2—Forman clay loam, 6 to 12 percent slopes, eroded

Composition

Forman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Gonvick and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

168D2—Forman clay loam, 12 to 20 percent slopes, eroded

Composition

Forman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Gonvick and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

168E—Forman clay loam, 20 to 30 percent slopes

Composition

Forman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 20 to 30 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Gonvick and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Formdale Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic class: Fine-loamy, mixed Udic Haploborolls

Typical Pedon

Formdale clay loam, in an area of Formdale-Buse complex, 2 to 6 percent slopes, 1,350 feet south and

250 feet east of the northwest corner of sec. 23, T. 140 N., R. 43 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR4/1) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bw—8 to 15 inches; dark brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable; about 4 percent gravel; neutral; clear smooth boundary.

Bk—15 to 26 inches; light yellowish brown (10YR 6/4) clay loam; weak medium subangular blocky structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

C—26 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 8 to 20 inches
Thickness of the mollic epipedon: 8 to 14 inches
Content of rock fragments: 2 to 8 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam

Bw horizon:
Hue—10YR; 2.5Y in the lower part
Value—3 to 5
Chroma—3 or 4
Texture—clay loam, silty clay loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—clay loam or silty clay loam

C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—clay loam or silty clay loam

171B—Formdale clay loam, 2 to 5 percent slopes

Composition

Formdale and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 5 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Aazdahl and similar soils
- Flom and similar soils
- Quam and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

579C2—Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded

Composition

Formdale and similar soils: About 35 percent
Langhei and similar soils: About 35 percent
Sandberg and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Langhei
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

Sandberg
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Aazdahl and similar soils
- Flom and similar soils
- Forada and similar soils
- Lakepark and similar soils
- Quam and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

931C2—Formdale-Langhei complex, 6 to 12 percent slopes, eroded

Composition

Formdale and similar soils: About 55 percent
Langhei and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Langhei
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1234B—Formdale-Buse complex, 2 to 6 percent slopes

Composition

Formdale and similar soils: About 60 percent
Buse and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Formdale—2 to 6 percent; Buse—3 to 6 percent

Component Description

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Buse
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1235B—Formdale-Buse-Sandberg complex, 2 to 6 percent slopes

Composition

Formdale and similar soils: About 40 percent
Buse and similar soils: About 25 percent
Sandberg and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Formdale—2 to 6 percent; Buse—3 to 6 percent; Sandberg—2 to 6 percent

Component Description

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Buse
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Sandberg
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the

"Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Foxlake Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, frigid Vertic Epiaquolls

Typical Pedon

Foxlake silty clay loam, 1,500 feet north and 2,600 feet west of the southeast corner of sec. 11, T. 139 N., R. 42 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine subangular blocky structure; friable; about 1 percent gravel; neutral; abrupt smooth boundary.

A—10 to 19 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak medium subangular blocky structure; friable; about 1 percent gravel; neutral; clear smooth boundary.

Bg—19 to 38 inches; dark gray (5Y 4/1) silty clay loam; weak fine subangular blocky structure; firm; about 2 percent gravel; common light gray (10YR 7/2) filaments and threads of segregated lime; slightly effervescent; slightly alkaline; clear smooth boundary.

Bkg—38 to 49 inches; light olive gray (5Y 6/2) silty clay loam; weak medium angular blocky structure; firm; common medium distinct yellowish brown (10YR 5/6) iron concentrations; about 2 percent gravel; common light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg—49 to 60 inches; gray (5Y 6/1) silty clay loam; massive; firm; common fine prominent yellowish brown (10YR 5/6) iron concentrations; about 2 percent gravel; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 30 inches
Thickness of the mollic epipedon: 12 to 24 inches
Content of rock fragments: 1 to 4 percent

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam, silty clay, or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam, silty clay, or clay loam

1135—Foxlake silty clay loam

Composition

Foxlake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Audubon and similar soils
- Birchlake and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Friendship Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic class: Mixed, frigid Typic Udipsamments

Typical Pedon

Friendship loamy sand, 950 feet east and 300 feet south of the northwest corner of sec. 22, T. 138 N., R. 38 W.

A—0 to 3 inches; very dark gray (10YR 3/1) loamy sand, very dark gray (10YR 4/1) dry; weak very fine granular structure; very friable; about 1 percent gravel; slightly acid; clear smooth boundary.

Bw1—3 to 18 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; about 2 percent gravel; slightly acid; gradual smooth boundary.

Bw2—18 to 31 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid; clear smooth boundary.

BC—31 to 46 inches; pale brown (10YR 6/3) sand; single grain; loose; common medium prominent strong brown (7.5YR 4/6) iron concentrations; about 2 percent gravel; neutral; gradual smooth boundary.

C—46 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; common medium prominent dark yellowish brown (10YR 4/6) iron concentrations; about 2 percent gravel; neutral.

Range in Characteristics

Content of rock fragments: 0 to 15 percent gravel
Depth to carbonates: 40 to more than 60 inches

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—sand or loamy sand

BC and C horizons:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sand or coarse sand

564—Friendship loamy sand

Composition

Friendship and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on outwash plains
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Gonvick Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; next part—moderately slow or moderate; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 3 percent
Taxonomic class: Fine-loamy, mixed Aquic Argiborolls

Typical Pedon

Gonvick loam, 300 feet east and 1,800 feet south of the northwest corner of sec. 1, T. 142 N., R. 41 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak medium granular structure; friable; about 2 percent gravel; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/21) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; neutral; clear smooth boundary.

Bt1—12 to 22 inches; olive brown (2.5Y 4/3) clay loam; moderate medium subangular blocky structure; friable; few fine faint dark grayish brown (2.5Y 4/2) iron depletions; many thick very dark gray (10YR 3/1) clay films on faces of peds and in pores; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bt2—22 to 34 inches; olive brown (2.5Y 4/3) clay loam; moderate medium subangular blocky structure; friable; few fine faint dark grayish brown (2.5Y 4/2) iron depletions and common fine distinct (10YR 5/6) iron concentrations; few moderately thick very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear smooth boundary.

C—34 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; many fine faint grayish brown (2.5Y 5/2) iron depletions and common fine distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 4 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 38 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 2 to 8 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam or clay loam

Bk or C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or clay loam

180—Gonvick loam

Composition

Gonvick and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forman and similar soils
- Smiley and similar soils
- Quam and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Graycalm Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 0 to 30 percent
Taxonomic class: Mixed, frigid Argic Udipsamments

Typical Pedon

Graycalm loamy sand (fig. I-11), in an area of Graycalm-Menahga complex, 1 to 8 percent slopes, 3,300 feet south and 1,000 feet west of the northeast corner of sec. 23, T. 141 N., R. 36 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; about 1 percent gravel; slightly acid; abrupt smooth boundary.

E—6 to 21 inches; brown (10YR 5/3) sand, light brownish gray (10YR 6/2) dry; single grain; loose; about 1 percent gravel; slightly acid; gradual smooth boundary.

E and Bt—21 to 46 inches; yellowish brown (10YR 5/4) sand (E); single grain; loose; lamellae of dark brown (7.5YR 4/4) loamy sand (Bt) ¼ to 1 inch thick; weak medium subangular blocky structure; friable; common thin clay coatings on sand grains and clay bridging between sand grains; about 1 percent gravel; neutral; clear smooth boundary.

C—46 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 1 percent gravel; neutral.

Range in Characteristics

Content of rock fragments: 0 to 15 percent gravel
Depth to carbonates: 50 inches or more

Ap or A horizon:
Hue—10YR
Value—2 or 3; 3 or 4 in cultivated areas
Chroma—1 or 2; 2 or 3 in cultivated areas
Texture—loamy sand

E horizon:
Hue—10YR
Value—5 to 7
Chroma—1 to 3
Texture—sand, loamy sand, or loamy coarse sand

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 7
Chroma—4 to 8
Texture—sand or loamy sand

E part of the E and Bt horizon:
Hue—10YR
Value—5 to 7
Chroma—2 to 6
Texture—sand or loamy sand

Bt part of the E and Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—4 to 6
Texture—loamy sand, sandy loam, or fine sandy loam

C horizon:
Hue—10YR
Value—5 to 7
Chroma—2 to 6
Texture—sand or coarse sand

867B—Graycalm-Menahga complex, 1 to 8 percent slopes

Composition

Graycalm and similar soils: About 60 percent
Menahga and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

Menahga
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

867C—Graycalm-Menahga complex, 8 to 15 percent slopes

Composition

Graycalm and similar soils: About 60 percent
Menahga and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: Moderately low

Menahga
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

867E—Graycalm-Menahga complex, 15 to 30 percent slopes

Composition

Graycalm and similar soils: About 60 percent
Menahga and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.3 inches

Organic matter content: Moderately low

Menahga
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bootlake and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1249C—Graycalm-Bootlake complex, 8 to 15 percent slopes

Composition

Graycalm and similar soils: About 60 percent
Bootlake and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Graycalm
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderately low

Bootlake
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Friendship and similar soils
- Karlstad and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Hamerly Series

Depth class: Very deep
Drainage class: Moderately well drained and somewhat poorly drained
Permeability: Moderate or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 1 to 3 percent
Taxonomic class: Fine-loamy, frigid Aeric Calciaquolls

Typical Pedon

Hamerly clay loam, in an area of Hamerly-Winger complex, 1,100 feet south and 600 feet west of the northeast corner of sec. 21, T. 141 N., R. 43 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam,

dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; about 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—8 to 23 inches; pale brown (10YR 6/3) clay loam; weak very fine subangular blocky structure; friable; about 2 percent gravel; violently effervescent with lime disseminated throughout; slightly alkaline; gradual smooth boundary.

Bk2—23 to 33 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; friable; few fine distinct light gray (10YR 6/1) iron depletions; many light gray (10YR 7/2) filaments and threads of segregated lime; about 4 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

C—33 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; common medium distinct light gray (10YR 6/1) iron depletions; few light gray (10YR 7/2) filaments and threads of segregated lime; about 4 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 10 percent
Carbonates: Typically occurring throughout the profile

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—clay loam or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 7
Chroma—1 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—clay loam or loam

184—Hamerly loam

Composition

Hamerly and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Langhei and similar soils
- Barnes and similar soils
- Vallers and similar soils
- Quam and similar soils
- The depressional Winger soils and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

785—Hamerly-Winger complex

Composition

Hamerly and similar soils: About 60 percent
Winger and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Hamerly—flats and rises on moraines; Winger—rims of depressions and flats on moraines
Slope range: Hamerly—1 to 3 percent; Winger—0 to 2 percent

Component Description

Hamerly
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1.5 to 3.5 feet

Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: High

Winger
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Barnes and similar soils
- The depressional Colvin soils and similar soils
- Hamre and similar soils
- Quam and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1149—Hamerly clay loam

Composition

Hamerly and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Formdale and similar soils
- Langhei and similar soils
- Flom and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1967—Hamerly-Vallers complex

Composition

Hamerly and similar soils: About 55 percent
Vallers and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Hamerly—flats and rises on moraines; Vallers—rims of depressions and flats on moraines
Slope range: Hamerly—1 to 3 percent; Vallers—0 to 2 percent

Component Description

Hamerly
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

Vallers
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet

Available water capacity to 60 inches or root-limiting layer: About 11.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Barnes and similar soils
- McIntosh and similar soils
- Winger and similar soils
- The depressional Winger soils and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hamre Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow or moderate
Landform: Moraines
Parent material: Organic material and glaciolacustrine deposits or till
Slope range: 0 to 1 percent
Taxonomic class: Fine-loamy, mixed, nonacid, frigid Histic Humaquepts

Typical Pedon

Hamre muck, 2,100 feet west and 500 feet north of the southeast corner of sec. 1, T. 143 N., R. 42 W., in Mahnomen County, Minnesota:

Oa—0 to 14 inches; black (N 2/0) muck; about 15 percent fiber unrubbed, less than 5 percent rubbed; weak fine granular structure; very friable; neutral; clear smooth boundary.

A—14 to 19 inches; black (N 2/0) clay loam; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; clear wavy boundary.

Bg—19 to 60 inches; grayish brown (2.5Y 5/2) clay loam; weak very fine subangular blocky structure; friable; many coarse distinct light olive brown (2.5Y 5/4) and few medium prominent strong brown (7.5YR 5/8) iron concentrations; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 12 to 25 inches
Thickness of the organic material: 8 to 16 inches

Oa or Oap horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—muck

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam, clay loam, sandy clay loam, or silt loam
Content of rock fragments—0 to 10 percent

Bg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam, clay loam, sandy clay loam, or silt loam
Content of rock fragments—0 to 10 percent

1878—Hamre muck

Composition

Hamre and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 14.1 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Winger and similar soils
- Colvin and similar soils
- Smiley and similar soils
- Egglake and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Hangaard Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landform: Outwash plains and beach ridges
Parent material: Glacial outwash and beach deposits
Slope range: 0 to 2 percent
Taxonomic class: Sandy, mixed, frigid Typic Endoaquolls

Typical Pedon

Hangaard sandy loam, in an area of Rushlake and Hangaard soils, lake beaches, 1,700 feet west and 1,200 feet south of the northeast corner of sec. 8, T. 138 N., R. 41 W.

A—0 to 13 inches; black (N 2/0) sandy loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; about 5 percent gravel; neutral; clear smooth boundary.

Cg1—13 to 30 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; few fine faint olive brown (2.5Y 4/4) iron concentrations; common carbonate coatings on the underside of pebbles; about 35 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—30 to 60 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; few fine prominent strong brown (7.5YR 5/6) iron concentrations; common carbonate coatings on the underside of pebbles; about 30 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 11 to 24 inches
Thickness of the mollic epipedon: 7 to 20 inches
Thickness of the loamy mantle: 7 to 20 inches
Content of rock fragments: 10 to 35 percent gravel

Ap or A horizon:
Hue—10YR or neutral
Value—2
Chroma—0 or 1
Texture—sandy loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 to 3 (chroma of 3 occurs where hue is 5Y)
Texture—gravelly sand, gravelly coarse sand, or coarse sand

111—Hangaard sandy loam

Composition

Hangaard and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sverdrup and similar soils
- Osakis and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section

Haslie Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—slow or moderately slow
Landform: Moraines and outwash plains
Parent material: Organic material and coprogenous earth
Slope range: 0 to 1 percent
Taxonomic class: Coprogenous, euic Limnic Borosaprists

Typical Pedon

Haslie muck, 2,400 feet east and 800 feet north of the southwest corner of sec. 11, T. 140 N., R. 42 W.

Oap—0 to 8 inches; muck, black (10YR 2/1) broken face and rubbed; about 25 percent fiber unrubbed, about 5 percent rubbed; moderate medium platy structure; very friable; primarily herbaceous fiber; neutral; abrupt smooth boundary.

Oa1—8 to 21 inches; muck, black (10YR 2/1) broken face and rubbed; about 25 percent fiber unrubbed, about 5 percent rubbed; moderate medium platy structure; very friable; primarily herbaceous fiber; neutral; clear smooth boundary.

Oa2—21 to 43 inches; muck, black (N 2/0) broken face and rubbed; about 5 percent fiber unrubbed, about 1 percent rubbed; weak fine subangular blocky structure; very friable; primarily herbaceous fiber; neutral; clear smooth boundary.

Cg—43 to 60 inches; gray (5Y 5/1) mucky silt loam (coprogenous earth); massive; friable; about 10 percent shell fragments; violently effervescent with lime disseminated throughout; slightly alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Fiber content: Less than 35 percent unrubbed; less than 10 percent rubbed
Content of wood fragments: Less than 15 percent

Oa or Oap horizon:
Hue—10YR, 7.5YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—muck

Cg horizon:
Hue—10YR, 2.5Y, 5Y, 5GY, or neutral
Value—2 to 6
Chroma—0 to 3
Texture—mucky silt loam, mucky silty clay loam, or silt loam

746—Haslie muck

Composition

Haslie and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 21.4 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Winger and similar soils
- Smiley and similar soils
- Egglake and similar soils
- Paddock and similar soils
- Forada and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1113—Haslie, Seelyeville, and Cathro soils, ponded

Composition

Haslie: Variable
Seelyeville: Variable
Cathro: Variable

Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Haslie
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Available water capacity to 60 inches or root-limiting layer: About 16.7 inches
Organic matter content: Very high

Seelyeville
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

Cathro
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 4.0 feet above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 17.6 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Smiley and similar soils
- Paddock and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1230—Haslie and Nidaros soils, ponded

Composition

Haslie: Variable
Nidaros: Variable
Inclusions: About 10 percent

Setting

Landform: Depressions on outwash plains
Slope range: 0 to 1 percent

Component Description

Haslie
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Available water capacity to 60 inches or root-limiting layer: About 16.3 inches
Organic matter content: Very high

Nidaros
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and outwash
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Available water capacity to 60 inches or root-limiting layer: About 18.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hangaard and similar soils
- Forada and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Seelyeville and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Hillview Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately rapid
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Hillview fine sandy loam, 1,400 feet east and 150 feet north of the southwest corner of sec. 35, T. 138 N., R. 36 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; very friable; moderately acid; abrupt smooth boundary.

Eg—8 to 19 inches; grayish brown (2.5Y 5/2) loamy fine sand, light brownish gray (2.5Y 6/2) dry; weak medium platy structure; very friable; common medium distinct dark yellowish brown (10YR 3/4) iron concentrations; slightly acid; clear smooth boundary.

Btg—19 to 28 inches; grayish brown (2.5Y 5/2) fine sandy loam; weak fine subangular blocky structure; very friable; common medium distinct dark yellowish brown (10YR 4/6) iron concentrations; common thin very dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bg—28 to 43 inches; light brownish gray (2.5Y 6/2) fine sandy loam; weak fine subangular blocky structure; very friable; many medium prominent dark yellowish brown (10YR 4/6) iron concentrations; slightly acid; clear smooth boundary.

Cg1—43 to 48 inches; light olive brown (2.5Y 5/4) fine sand; single grain; loose; many coarse distinct light brownish gray (2.5Y 6/2) iron depletions; slightly acid; clear smooth boundary.

Cg2—48 to 60 inches; grayish brown (2.5Y 6/2) silt loam; massive; friable; common coarse distinct dark yellowish brown (10YR 3/6) iron concentrations; slightly acid.

Range in Characteristics

Depth to carbonates: 27 to 60 inches
Content of rock fragments: 0 to 5 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Eg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2
Texture—fine sand, fine sandy loam, sandy loam, loamy fine sand, or loamy sand

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—fine sandy loam, very fine sandy loam, sandy loam, or silt loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—stratified loamy fine sand, loamy very fine sand, loam, fine sandy loam, very fine sandy loam, silt loam, loamy sand, or sand

1365—Hillview fine sandy loam

Composition

Hillview and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rosy and similar soils
- Egglake and similar soils
- Paddock and similar soils
- Epoufette and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Karlstad Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 1 to 3 percent
Taxonomic class: Coarse-loamy, mixed Aquic Eutroboralfs

Typical Pedon

Karlstad sandy loam, 200 feet west and 2,500 feet south of the northeast corner of sec. 9, T. 141 N., R. 40 W.

A—0 to 3 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; about 2 percent gravel; neutral; abrupt smooth boundary.

E—3 to 15 inches; brown (10YR 5/3) loamy sand, light brownish gray (10YR 6/2) dry; weak thin platy structure; very friable; about 2 percent gravel; strongly acid; clear smooth boundary.

Bt—15 to 27 inches; dark brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few fine distinct gray (10YR 6/1) iron depletions; many thin dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; about 2 percent gravel; slightly acid; clear smooth boundary.

2C—27 to 60 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; common coarse distinct light olive brown (2.5Y 5/6) iron concentrations; few carbonate coatings on the underside of pebbles; about 15 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 8 to 30 inches
Thickness of the loamy mantle: 8 to 26 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent gravel

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 or 3
Texture—loamy sand, sand, sandy loam, or fine sandy loam
Content of rock fragments—0 to 15 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—coarse sandy loam, sandy loam, fine sandy loam, or sandy clay loam
Content of rock fragments—0 to 15 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—2 to 4
Texture—gravelly coarse sand or gravelly sand
Content of rock fragments—15 to 35 percent gravel

1306—Karlstad sandy loam

Composition

Karlstad and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on outwash plains
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.2 inches
Organic matter content: Moderate

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Bootlake and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lakepark Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Colluvium and till
Slope range: 1 to 3 percent
Taxonomic class: Fine-loamy, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Lakepark clay loam, 1,700 feet east and 200 feet south of the northwest corner of sec. 19, T. 139 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A1—8 to 20 inches; black (N 2/0) clay loam, very dark gray (N 3/0) dry; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A2—20 to 28 inches; very dark gray (N 3/0) clay loam, dark gray (N 4/0) dry; weak medium subangular blocky structure; friable; slightly alkaline; clear smooth boundary.

Bg—28 to 34 inches; olive gray (5Y 5/2) silty clay loam; weak medium subangular blocky structure; friable; few fine distinct dark yellowish brown (10YR 4/6) iron concentrations; about 1 percent gravel; slightly alkaline; clear smooth boundary.

Cg—34 to 60 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; common medium distinct yellowish brown (10YR 5/8) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 25 to 50 inches
Thickness of the mollic epipedon: 24 to 60 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—clay loam
Content of rock fragments—0 to 5 percent

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam, silty clay loam, or loam
Content of rock fragments—0 to 5 percent

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—clay loam, loam, or silty clay loam
Content of rock fragments—2 to 8 percent

1938—Lakepark clay loam

Composition

Lakepark and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Colluvium and till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Flom and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Lamoure Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow or moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls

Typical Pedon

Lamoure silt loam, channeled, frequently flooded, 150 feet south and 150 feet west of the northeast corner of sec. 19, T. 140 N., R. 43 W.

A1—0 to 10 inches; black (N 2/0) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; strongly effervescent; slightly alkaline; gradual smooth boundary.

A2—10 to 33 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; strongly effervescent with lime disseminated throughout; slightly alkaline; gradual smooth boundary.

A3—33 to 41 inches; very dark gray (5Y 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; strongly effervescent with lime disseminated throughout; slightly alkaline; clear smooth boundary.

Cg1—41 to 53 inches; grayish brown (2.5Y 5/2) fine sandy loam; massive; very friable; common coarse distinct light olive brown (2.5Y 5/4) iron concentrations; slightly effervescent with lime disseminated throughout; slightly alkaline; clear smooth boundary.

Cg2—53 to 60 inches; gray (5Y 5/1), stratified sandy loam and loamy fine sand; massive; very friable; slightly effervescent with lime disseminated throughout; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 24 to 60 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam or silty clay loam
Content of rock fragments—none

Cg horizon:
Hue—2.5Y or 5Y
Value—2 to 6
Chroma—0 to 2
Texture—stratified silt loam to loamy fine sand
Content of rock fragments—0 to 3 percent gravel

418—Lamoure silty clay loam, occasionally flooded

Composition

Lamoure and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Flooding: Occasional
Seasonal high water table: At the surface to 1.5 feet below the surface
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordum and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

1251—Lamoure silt loam, channeled, frequently flooded

Composition

Lamoure and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Flooding: Frequent
Seasonal high water table: At the surface to 1.5 feet below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Sedgeville and similar soils

Major Uses of the Unit

• Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

• Wildlife Habitat section

Langhei Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 3 to 30 percent
Taxonomic class: Fine-loamy, mixed, frigid Typic Eutrochrepts

Typical Pedon

Langhei clay loam, in an area of Formdale-Langhei complex, 6 to 12 percent slopes, eroded, 2,500 feet north and 550 feet east of the southwest corner of sec. 23, T. 140 N., R. 43 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bk—8 to 19 inches; yellowish brown (10YR 5/4) clay loam; weak medium subangular blocky structure; friable; few strong brown (7.5YR 4/6) iron concretions; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—19 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; few strong brown (7.5YR 4/6) iron concretions; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: Occurring throughout the profile
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—clay loam or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y or 10YR
Value—4 to 7
Chroma—2 to 4
Texture—loam or clay loam

942D2—Langhei-Barnes complex, 12 to 20 percent slopes, eroded

Composition

Langhei and similar soils: About 55 percent
Barnes and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Langhei
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderately low

Barnes
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Vallers and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

943D2—Langhei-Formdale complex, 12 to 20 percent slopes, eroded

Composition

Langhei and similar soils: About 50 percent
Formdale and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Langhei
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

943E—Langhei-Formdale complex, 20 to 30 percent slopes

Composition

Langhei and similar soils: About 55 percent
Formdale and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 20 to 30 percent

Component Description

Langhei
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

Formdale
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Flom and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Lida Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 30 percent
Taxonomic class: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Lida sandy loam, in an area of Lida-Two Inlets complex, 8 to 15 percent slopes, 1,450 feet west and 750 feet south of the northeast corner of sec. 5, T. 137 N., R. 40 W., in Otter Tail County, Minnesota:

A1—0 to 2 inches; black (10YR 2/1) sandy loam, very dark brown (10YR 2/2) dry; weak fine and medium granular structure; very friable; many very fine and fine roots; about 3 percent gravel; neutral; clear smooth boundary.

A2—2 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; about 6 percent gravel; neutral; abrupt smooth boundary.

E—8 to 17 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak medium and coarse subangular blocky structure; friable; few very fine and fine roots; about 8 percent gravel; neutral; clear wavy boundary.

Bt1—17 to 25 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; moderate coarse and medium subangular blocky structure; firm; few very fine and fine roots; many faint brown (10YR 4/3) continuous clay films on faces of peds and in pores; about 16 percent gravel; neutral; clear wavy boundary.

Bt2—25 to 36 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; moderate medium and fine subangular blocky structure; friable; few very fine and fine roots; common faint brown (10YR 4/3) discontinuous clay bridging between sand grains; about 17 percent gravel; slightly acid; gradual wavy boundary.

Bt3—36 to 41 inches; brown (10YR 4/3) gravelly loamy sand; moderate fine and medium subangular blocky structure; friable; few very fine and fine roots; many faint brown (10YR 4/3) continuous clay bridging between sand grains; about 15 percent gravel; neutral; abrupt wavy boundary.

2C—41 to 60 inches; brown (10YR 5/3) gravelly sand; single grain; loose; about 18 percent gravel; common carbonate coatings on the underside of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 27 to 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3

Chroma—1 to 3
Texture—loamy sand and sandy loam
Content of rock fragments—0 to 7 percent gravel

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy coarse sand, loamy fine sand, or sandy loam
Content of rock fragments—0 to 7 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam, coarse sandy loam, or the gravelly analogs of these textures; subhorizons are loamy sand, sandy clay loam, loamy coarse sand, loam, or the gravelly analogs of these textures
Content of rock fragments—0 to 7 percent gravel

2Bk horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 7
Chroma—2 to 6
Texture—loamy sand, loamy coarse sand, sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

2C horizon (if it occurs):
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 7
Chroma—2 to 6
Texture—sand, coarse sand, gravelly sand, or gravelly coarse sand
Content of rock fragments—10 to 35 percent gravel

1196B—Lida-Two Inlets complex, 1 to 8 percent slopes

Composition

Lida and similar soils: About 65 percent
Two Inlets and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Lida
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: Moderate

Two Inlets
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Rushlake and similar soils
- Epoufette and similar soils
- Hangaard and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1196C—Lida-Two Inlets complex, 8 to 15 percent slopes

Composition

Lida and similar soils: About 60 percent
Two Inlets and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Lida
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderate

Two Inlets
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Rushlake and similar soils
- Epoufette and similar soils
- Hangaard and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1196E—Lida-Two Inlets complex, 15 to 30 percent slopes

Composition

Lida and similar soils: About 60 percent
Two Inlets and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Lida
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

Two Inlets
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Rushlake and similar soils
- Epoufette and similar soils
- Hangaard and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lindaas Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; next part—slow;

lower part—moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, frigid Typic Argiaquolls

Typical Pedon

Lindaas silty clay loam, morainic, 2,300 feet east and 1,200 feet north of the southwest corner of sec. 33, T. 139 N., R. 43 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—8 to 14 inches; black (N 2/0) silty clay, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; neutral; gradual smooth boundary.

Btg1—14 to 20 inches; very dark grayish brown (2.5Y 3/2) clay; moderate fine subangular blocky structure; friable; many thick very dark gray (N 3/0) clay films on faces of peds and in pores; neutral; gradual smooth boundary.

Btg2—20 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate medium subangular blocky structure; friable; common fine distinct olive brown (2.5Y 5/4) iron concentrations; many thin very dark grayish brown (2.5Y 3/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Cg—29 to 60 inches; grayish brown (2.5Y 5/2) silty clay; weak medium platy soil aggregates; friable; common medium faint olive brown (2.5Y 5/4) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 35 inches
Thickness of the mollic epipedon: 16 inches or more

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay or clay

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7
Chroma—1 to 4
Texture—silt loam, clay loam, or silty clay loam

1129—Lindaas silty clay loam, morainic

Composition

Lindaas and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bygland and similar soils
- Dalbo and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lupton Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landform: Moraines and outwash plains
Parent material: Organic materials
Slope range: 0 to 1 percent
Taxonomic class: Euic Typic Borosaprists

Typical Pedon

Lupton muck, in an area of Mooselake and Lupton soils,

1,200 feet west and 200 feet north of the southeast corner of sec. 13, T. 142 N., R. 37 W.

Oa1—0 to 15 inches; muck, very dark brown (10YR 2/2) broken face and black (10YR 2/1) rubbed; about 45 percent fiber, about 15 percent rubbed; about 15 percent woody fragments; weak thin platy structure; very friable; primarily herbaceous fibers; slightly acid; gradual smooth boundary.

Oa2—15 to 32 inches; muck, very dark brown (10YR 2/2) broken face and black (10YR 2/1) rubbed; about 40 percent fiber, about 10 percent rubbed; about 10 percent woody fragments; weak medium platy structure; very friable; primarily herbaceous fibers; slightly acid; gradual smooth boundary.

Oe—32 to 39 inches; mucky peat, dark brown (7.5YR 3/2) broken face and rubbed; about 65 percent fiber, about 25 percent rubbed; about 10 percent wood fragments; weak medium platy structure; very friable; primarily herbaceous fibers; slightly acid; gradual smooth boundary.

O'a—39 to 60 inches; muck, very dark brown (10YR 2/2) broken face and black (10YR 2/1) rubbed; about 40 percent fiber, about 10 percent rubbed; about 5 percent woody fragments; weak thin platy structure; very friable; primarily herbaceous fibers; neutral.

Range in Characteristics

Thickness of the organic material: Greater than 51 inches
Content of wood fragments: 10 to 30 percent
Thickness of hemic material in the subsurface and bottom tiers: Less than 10 inches

Oap, Ap, or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—muck

McIntosh Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; lower part—moderate or moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits and till
Slope range: 0 to 3 percent
Taxonomic class: Fine-silty, frigid Aeric Calciaquolls

Typical Pedon

McIntosh silt loam, 150 feet east and 2,400 feet north of the southwest corner of sec. 8, T. 141 N., R. 42 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—9 to 17 inches; dark gray (10YR 4/1) silt loam; weak fine subangular blocky structure; friable; violently effervescent with lime disseminated throughout; slightly alkaline; gradual smooth boundary.

Bk2—17 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam; weak fine subangular blocky structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; violently effervescent; moderately alkaline; clear smooth boundary.

2C—30 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; common medium distinct light gray (10YR 6/1) iron depletions and yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 3 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the lacustrine mantle: 24 to 40 inches
Carbonates: Occurring throughout the profile

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silt loam
Content of rock fragments—none

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 4
Texture—silt loam, silty clay loam, or loam
Content of rock fragments—none

C horizon (if it occurs):
Hue—2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—silt loam or silty clay loam
Content of rock fragments—2 to 10 percent

2C horizon:
Hue—2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—loam or clay loam
Content of rock fragments—2 to 10 percent

108—McIntosh silt loam

Composition

McIntosh and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Barnes and similar soils
- Winger and similar soils
- The depressional Winger soils and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Meehan Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic class: Mixed, frigid Aquic Udipsamments

Typical Pedon

Meehan loamy sand, 1,850 feet north and 100 feet east of the southwest corner of sec. 26, T. 139 N., R. 36 W.

A—0 to 5 inches; very dark gray (10YR 3/1) loamy sand, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; about 3 percent gravel; strongly acid; clear smooth boundary.

E—5 to 13 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; very friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; about 5 percent gravel; moderately acid; clear smooth boundary.

Bw—13 to 25 inches; brown (10YR 5/3) coarse sand; single grain; loose; common fine distinct strong brown (7.5YR 5/6) iron concentrations and common fine distinct light brownish gray (2.5Y 6/2) iron depletions; about 5 percent gravel; moderately acid; clear smooth boundary.

C—25 to 60 inches; light yellowish brown (2.5Y 6/4) coarse sand; single grain; loose; common fine distinct yellowish brown (10YR 5/6) iron concentrations and common medium distinct light brownish gray (2.5Y 6/2) iron depletions; about 5 percent gravel; slightly acid.

Range in Characteristics

Content of rock fragments: 0 to 15 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

E horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 or 3
Texture—loamy sand or sand

Bw or BC horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 8
Texture—sand, loamy sand, coarse sand, or loamy coarse sand

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—coarse sand or sand

202—Meehan loamy sand

Composition

Meehan and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on outwash plains
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 1 to 3 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Friendship and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Menahga Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 30 percent
Taxonomic class: Mixed, frigid Typic Udipsamments

Typical Pedon

Menahga loamy sand, in an area of Graycalm-Menahga complex, 1 to 8 percent slopes, 2,300 feet west and 400 feet north of the southeast corner of sec. 22, T. 139 N., R. 36 W.

A—0 to 3 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; about 2 percent gravel; moderately acid; clear smooth boundary.

Bw1—3 to 12 inches; dark brown (10YR 4/3) loamy sand, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; very friable; about 3 percent gravel; strongly acid; clear smooth boundary.

Bw2—12 to 33 inches; dark yellowish brown (10YR 4/6) coarse sand; single grain; loose; about 11 percent gravel; moderately acid; gradual smooth boundary.

Bw3—33 to 42 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 1 percent gravel; neutral; clear smooth boundary.

BC—42 to 50 inches; yellowish brown (10YR 5/6) coarse sand; single grain; loose; about 3 percent gravel; neutral; clear smooth boundary.

C—50 to 60 inches; light yellowish brown (10YR 6/4) coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 6 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Content of rock fragments: 0 to 10 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—coarse sand or sand

C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—coarse sand or sand

Mooselake Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate or moderately rapid
Landform: Moraines and outwash plains
Parent material: Organic materials

Figure I-6.—A profile of Arvilla sandy loam. This soil has a loamy mantle about 14 to 25 inches thick over sand and gravel. The soil formed in glacial outwash. Depth is marked in feet.

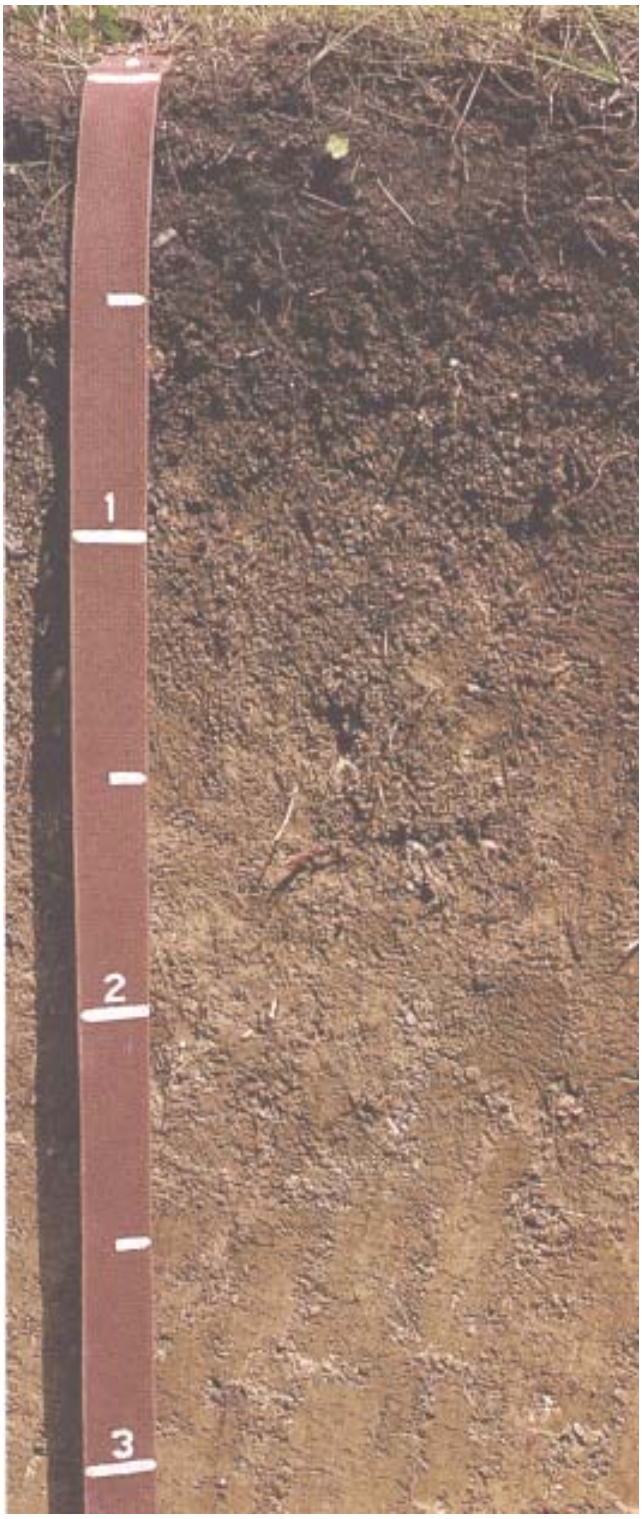


Figure I-7.—A profile of Audubon silty clay loam. The surface layer, which has been darkened by organic matter, extends to a depth of about 10 inches. This soil formed in glacial till. Depth is marked in feet.

Figure I-8.—A profile of Bootlake sandy loam. A layer of clay depletion is between the depths of 4 and 24 inches, and a layer of clay accumulation is between the depths of 24 and 38 inches. This soil formed in glacial outwash. Depth is marked in feet.

Figure I-9.—A profile of Dorset sandy loam. This soil has a loamy mantle about 18 inches thick over sand and gravel. The soil formed in glacial outwash. The content of gravel in the underlying material ranges from 10 to 35 percent. Depth is marked in feet.

Figure I-10.—A profile of Eagleview loamy sand. Lamellae and layers of clay accumulation are between the depths of 30 and 47 inches. Free carbonates are at a depth of about 47 inches. This soil formed in glacial outwash. Depth is marked in feet.

Figure I-11.—A profile of Graycalm loamy sand. A layer of clay depletion is between the depths of 3 and 20 inches. Lamellae are at a depth of about 20 inches. This soil formed in glacial outwash. The content of gravel is less than 15 percent. Depth is marked in feet.

Figure I-12.—A profile of Nebish loam. A layer of clay accumulation is between the depths of 12 and 20 inches. The underlying material is glacial till. Depth is marked in feet.

Figure I-13.—A profile of Sandberg coarse sandy loam. The surface layer, which has been darkened by organic matter, extends to a depth of about 8 inches. Free carbonates are at a depth of about 18 inches. This soil formed in glacial outwash. Depth is marked in feet.

Figure I-14.—A profile of Snellman sandy loam. A layer of clay accumulation is between the depths of 12 and 20 inches. This soil formed in glacial till. Depth is marked in feet.

Figure I-15.—A profile of Sugarbush sandy loam. A layer of clay accumulation is between the depths of 16 and 27 inches. This soil formed in glacial outwash. Depth is marked in feet.

Figure I-16.—A profile of Two Inlets coarse sandy loam. The layer between the depths of 10 and 24 inches has clay bridging between sand grains. This soil formed in glacial outwash. Depth is marked in feet.

Slope range: 0 to 1 percent
Taxonomic class: Euic Typic Borohemists

Typical Pedon

Mooselake muck, in an area of Mooselake and Lupton soils, 2,400 feet west and 1,900 feet north of the southeast corner of sec. 11, T. 145 N., R. 37 W., in Clearwater County, Minnesota:

Oa—0 to 15 inches; muck, very dark grayish brown (10YR 3/2) broken face, very dark brown (10YR 2/2) rubbed and pressed; 20 percent fiber, 5 percent rubbed; weak medium platy structure; very friable; about 40 percent woody fragments more than 2 millimeters in diameter; slightly acid; clear wavy boundary.

Oe1—15 to 40 inches; mucky peat, dark yellowish brown (10YR 4/4) broken face, dark brown (10YR 4/3) rubbed and pressed; 65 percent fiber, 40 percent rubbed; weak medium platy structure; very friable; about 10 percent woody fragments more than 2 millimeters in diameter; slightly acid; gradual wavy boundary.

Oe2—40 to 60 inches; mucky peat, dark yellowish brown (10YR 4/4) broken face, very dark grayish brown (10YR 3/2) rubbed and pressed; 50 percent fiber, 35 percent rubbed; weak medium platy structure; very friable; about 10 percent woody fragments more than 2 millimeters in diameter; slightly acid.

Range in Characteristics

Thickness of the organic material: Greater than 51 inches
Fiber content: 35 to 75 percent unrubbed; 15 to 50 percent rubbed
Content of wood fragments: 15 to 50 percent

Oa or Oap horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture of the fine-earth fraction—muck

Oe horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 6
Texture of the fine-earth fraction—mucky peat

797—Mooselake and Lupton soils

Composition

Mooselake: Variable
Lupton: Variable
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Mooselake
Surface layer texture: Mucky peat
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 27.0 inches
Organic matter content: Very high

Lupton
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Egglake and similar soils
- Epoufette and similar soils
- Lindaas and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

Naytahwaush Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately slow; next part—slow; lower part—moderately slow
Landform: Moraines
Parent material: Till

Slope range: 2 to 30 percent
Taxonomic class: Fine, montmorillonitic Mollic Eutroboralfs

Typical Pedon

Naytahwaush loam, 8 to 15 percent slopes, 800 feet west and 400 feet north of the southeast corner of sec. 12, T. 142 N., R. 41 W.

A—0 to 4 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 1 percent gravel; slightly acid; clear smooth boundary.

E—4 to 6 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; friable; about 1 percent gravel; slightly acid; clear smooth boundary.

Bt—6 to 23 inches; dark brown (10YR 4/3) silty clay; moderate medium angular blocky structure; friable; many thin dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; about 2 percent gravel; moderately acid; gradual smooth boundary.

BC—23 to 32 inches; light olive brown (2.5Y 4/3) silty clay loam; moderate medium angular blocky structure; friable; few thin very dark grayish brown (10YR 3/2) clay films on faces of fractures; many light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; slightly alkaline; gradual wavy boundary.

C—32 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; moderate medium angular blocky soil aggregates; friable; common medium distinct gray (10YR 5/1) iron depletions; common medium distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 40 inches
Content of rock fragments: 1 to 5 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

E horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—loam, silt loam, or fine sandy loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 or 4
Texture—clay, silty clay, or silty clay loam

BC horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—clay, silty clay loam, or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 5
Texture—clay loam or silty clay loam

718B—Naytahwaush loam, 2 to 8 percent slopes

Composition

Naytahwaush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Birchlake and similar soils
- Foxlake and similar soils
- Auganaush and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

718C—Naytahwaush loam, 8 to 15 percent slopes

Composition

Naytahwaush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Birchlake and similar soils
- Auganaush and similar soils
- Foxlake and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

718E—Naytahwaush loam, 15 to 30 percent slopes

Composition

Naytahwaush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Birchlake and similar soils
- Auganaush and similar soils
- Foxlake and similar soils
- Dovray and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Nebish Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic class: Fine-loamy, mixed Typic Eutroboralfs

Typical Pedon

Nebish loam (fig. I-12), in an area of Nebish-Sugarbush complex, 2 to 8 percent slopes, 300 feet east and 1,300 feet south of the northwest corner of sec. 20, T. 141 N., R. 40 W.

A—0 to 2 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak very fine granular structure; friable; about 3 percent gravel; slightly acid; abrupt smooth boundary.

E—2 to 7 inches; brown (10YR 5/3) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; very friable; about 8 percent gravel; slightly acid; clear smooth boundary.

Bt1—7 to 16 inches; dark brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; friable; many brown (10YR 5/3) sand and silt coatings on faces of peds and in pores; about 3 percent gravel; moderately acid; gradual smooth boundary.

Bt2—16 to 26 inches; dark brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; friable; many thin dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; about 5 percent gravel; moderately acid; clear smooth boundary.

Bk—26 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; common fine distinct yellowish brown (10YR 5/6) iron concentrations; about 10 percent gravel; many light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 42 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, very fine sandy loam, loam, or silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—clay loam or loam

40B—Nebish loam, 2 to 8 percent slopes

Composition

Nebish and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

40C—Nebish loam, 8 to 15 percent slopes

Composition

Nebish and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

40E—Nebish loam, 15 to 30 percent slopes

Composition

Nebish and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

951B—Nebish-Sugarbush complex, 2 to 8 percent slopes

Composition

Nebish and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Nebish
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches
Organic matter content: Moderately low

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Eagleview and similar soils
- Balmlake and similar soils
- Beltrami and similar soils
- Smiley and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

951C—Nebish-Sugarbush complex, 8 to 15 percent slopes

Composition

Nebish and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Nebish
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches
Organic matter content: Moderately low

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Eagleview and similar soils
- Balmlake and similar soils
- Beltrami and similar soils
- Smiley and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

951E—Nebish-Sugarbush complex, 15 to 30 percent slopes

Composition

Nebish and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Nebish
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches
Organic matter content: Moderately low

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Eagleview and similar soils
- Balmlake and similar soils
- Beltrami and similar soils
- Smiley and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Nidaros Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderately slow to moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Organic materials and outwash
Slope range: 0 to 1 percent
Taxonomic class: Loamy, mixed, euic Terric Borosaprists

Typical Pedon

Nidaros muck, 2,200 feet south and 100 feet west of the northeast corner of sec. 15, T. 139 N., R. 41 W.

Oa—0 to 31 inches; muck, black (7.5YR 2/0) broken face and rubbed; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A—31 to 42 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; slightly acid; clear smooth boundary.

Bg—42 to 49 inches; dark gray (5Y 4/1) sandy loam; weak medium subangular blocky structure; friable; about 3 percent gravel; neutral; clear smooth boundary.

2Cg—49 to 60 inches; gray (5Y 5/1) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 15 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Content of wood fragments: 0 to 15 percent
Content of rock fragments: None in the organic material; 0 to 35 percent gravel in the mineral sediments

Oa or Oap horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 to 4
Chroma—0 to 3
Texture—muck

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, sandy clay loam, or loam

2Cg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—sand, coarse sand, or the gravelly analogs of these textures

1111—Nidaros muck, frequently flooded

Composition

Nidaros and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and outwash
Flooding: Frequent
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 13.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forada and similar soils
- Hangaard and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

1136—Nidaros muck

Composition

Nidaros and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 16.2 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forada and similar soils
- Epoufette and similar soils
- Hangaard and similar soils
- Seelyeville and similar soils
- The depressional Forada soils and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

Nymore Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 20 percent
Taxonomic class: Mixed, frigid Typic Udipsamments

Typical Pedon

Nymore loamy sand, in an area of Verndale-Nymore complex, 1 to 6 percent slopes, 400 feet east and 200 feet north of the southwest corner of sec. 29, T. 140 N., R. 36 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loamy sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; about 4 percent gravel; strongly acid; abrupt smooth boundary.

Bw1—7 to 17 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; about 5 percent gravel; moderately acid; clear smooth boundary.

Bw2—17 to 41 inches; dark brown (7.5YR 5/4) coarse sand; single grain; loose; about 8 percent gravel; moderately acid; gradual smooth boundary.

C—41 to 60 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; about 5 percent gravel; slightly acid.

Range in Characteristics

Depth to carbonates: 40 inches or more
Content of rock fragments: 0 to 10 percent gravel

Ap or A horizon:
Hue—10YR

Value—2 or 3
Chroma—1 to 3
Texture—loamy sand

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—coarse sand, sand, loamy coarse sand, or loamy sand

C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—2 to 6
Texture—coarse sand or sand

207D—Nymore loamy sand, 12 to 20 percent slopes

Composition

Nymore and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Verndale and similar soils
- Oylen and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1248C—Nymore-Verndale complex, 6 to 12 percent slopes

Composition

Nymore and similar soils: About 60 percent
Verndale and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Nymore
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

Verndale
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Osakis Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic class: Sandy, mixed Aquic Haploborolls

Typical Pedon

Osakis sandy loam, 2,000 feet west and 2,100 feet south of the northeast corner of sec. 29, T. 138 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; abrupt smooth boundary.

Bw1—8 to 11 inches; dark brown (10YR 3/3) sandy loam; weak medium subangular blocky structure; friable; about 2 percent gravel; neutral; gradual smooth boundary.

Bw2—11 to 18 inches; dark yellowish brown (10YR 4/4) coarse sandy loam; weak fine subangular blocky structure; very friable; about 6 percent gravel; neutral; clear smooth boundary.

2C1—18 to 35 inches; pale brown (10YR 6/3) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 20 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2C2—35 to 60 inches; light olive brown (2.5Y 5/3) gravelly coarse sand; single grain; loose; common medium faint light brownish gray (10YR 6/2) iron depletions; common carbonate coatings on the underside of pebbles; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 16 to 25 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 12 to 20 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 10 percent gravel

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 to 4
Texture—sandy loam or loam
Content of rock fragments—0 to 10 percent gravel

2Bw horizon (if it occurs):
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—sand, coarse sand, loamy coarse sand, loamy sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 or 3
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

413—Osakis sandy loam

Composition

Osakis and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on outwash plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Arvilla and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Oylen Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic class: Coarse-loamy, mixed Aquic Argiborolls

Typical Pedon

Oylen sandy loam, 1,800 feet west and 250 feet south of the northeast corner of sec. 21, T. 141 N., R. 37 W.

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 5 percent gravel; neutral; abrupt smooth boundary.

A—10 to 13 inches; very dark gray (10YR 3/1) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; clear smooth boundary.

Bt—13 to 22 inches; dark brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; many thin dark brown (10YR 3/3) clay films on faces of peds and in pores; about 5 percent gravel; neutral; clear smooth boundary.

2Bw1—22 to 33 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 7 percent gravel; neutral; gradual smooth boundary.

2Bw2—33 to 52 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; common medium distinct yellowish brown (10YR 5/6) iron concentrations and common medium prominent light brownish gray (2.5Y 6/2) iron depletions; about 7 percent gravel; neutral; clear smooth boundary.

2C—52 to 60 inches; light brownish gray (2.5Y 6/2) coarse sand; single grain; few fine distinct yellowish brown (10YR 5/6) iron concentrations; loose; common carbonate coatings on the underside of pebbles; about 10 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 36 to 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 15 to 24 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of rock fragments—0 to 5 percent gravel

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or loam
Content of rock fragments—0 to 5 percent gravel

2Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 25 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sand, coarse sand, very coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 25 percent gravel

1975—Oylen sandy loam

Composition

Oylen and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on outwash plains
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 3.5 feet

Available water capacity to 60 inches or root-limiting layer: About 5.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nymore and similar soils
- Verndale and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Paddock Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, mixed, frigid Udollic Epiaqualfs

Typical Pedon

Paddock fine sandy loam, stony, 1,300 feet east and 300 feet south of the northwest corner of sec. 28, T. 138 N., R. 36 W.

A—0 to 4 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 8 percent gravel; slightly acid; clear smooth boundary.

E1—4 to 11 inches; dark grayish brown (2.5Y 4/2) sandy loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; few fine distinct dark yellowish brown (10YR 4/6) iron concentrations; about 8 percent gravel; neutral; clear wavy boundary.

E2—11 to 16 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; friable; common coarse distinct dark yellowish brown (10YR 4/6) iron concentrations; about 8 percent gravel; slightly acid; clear smooth boundary.

Btg—16 to 26 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium subangular blocky structure; friable; common coarse distinct dark yellowish brown (10YR 4/6) iron concentrations; many thin dark grayish brown (2.5Y 5/2) clay films on faces of peds and in pores; about 6 percent gravel; moderately acid; clear smooth boundary.

BCg—26 to 43 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common medium distinct grayish brown (2.5Y 5/2) iron depletions; about 6 percent gravel; moderately acid; clear smooth boundary.

Cd—43 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam; weak thin platy soil aggregates; firm; few light gray (10YR 7/2) filaments and threads of segregated lime; about 6 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches
Content of rock fragments: 2 to 15 percent
Depth to dense till: 40 to 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or fine sandy loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam or sandy clay loam

Cd horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam

1210—Paddock-Epoufette complex

Composition

Paddock and similar soils: About 50 percent
Epoufette and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Flats
Slope range: 0 to 2 percent

Component Description

Paddock
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1 to 2 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: High

Epoufette
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 2.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Blowers and similar soils
- Karlstad and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1321—Paddock fine sandy loam, stony

Composition

Paddock and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Foot slopes and toe slopes
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1 to 2 feet
Available water capacity to 60 inches or root-limiting layer: About 6.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Blowers and similar soils
- Hillview and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1030—Pits, gravel-Udipsamments complex

Composition

Pits: 50 percent
Udipsamments and similar soils: About 45 percent

Setting

Landform: Outwash plains, lake plains, and moraines
Slope range: 1 to 50 percent

Component Description

Pits
Dominant parent material: Glacial outwash

Udipsamments
Surface layer texture: Sand
Depth class: Very deep (more than 60 inches)

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Very low

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Quam Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Colluvium and till
Slope range: 0 to 1 percent
Taxonomic class: Fine-silty, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Quam silty clay loam, 1,400 feet west and 250 feet north of the southeast corner of sec. 4, T. 142 N., R. 41 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; slightly alkaline; abrupt smooth boundary.

A1—10 to 29 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak medium subangular blocky structure; friable; slightly alkaline; gradual smooth boundary.

A2—29 to 42 inches; very dark gray (5Y 3/1) silty clay loam, very dark gray (5Y 3/1) dry; weak fine subangular blocky structure; friable; slightly alkaline; gradual smooth boundary.

Cg1—42 to 48 inches; light olive gray (5Y 6/2) silty clay loam; massive; friable; common medium distinct dark yellowish brown (10YR 4/6) iron concentrations; few light gray (2.5Y 7/2) filaments and threads of segregated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg2—48 to 60 inches; olive gray (5Y 5/2) clay loam; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to more than 60 inches
Thickness of the mollic epipedon: 24 to 80 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silt loam
Content of rock fragments—0 to 5 percent

Bg horizon (if it occurs):
Hue—2.5Y, 5Y, or neutral
Value—2 to 4
Chroma—0 or 1
Texture—silty clay loam or silt loam
Content of rock fragments—0 to 8 percent

Cg and 2Cg horizons:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silt loam, silty clay loam, clay loam, or loam
Content of rock fragments—0 to 8 percent

344—Quam silty clay loam

Composition

Quam and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Colluvium and till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Vallers and similar soils

- Winger and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1227—Quam, Cathro, and Urness soils, ponded

Composition

Quam and similar soils: About 30 percent
Cathro and similar soils: About 30 percent
Urness and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Quam
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Colluvium and till
Flooding: None
Seasonal high water table: 3.0 feet above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches
Organic matter content: Very high

Cathro
Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 4.0 feet above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 17.9 inches
Organic matter content: Very high

Urness
Surface layer texture: Mucky silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Colvin and similar soils
- Smiley and similar soils
- Foxlake and similar soils
- Seelyeville and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Rifle Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate or moderately rapid
Landform: Moraines and outwash plains
Parent material: Organic materials
Slope range: 0 to 1 percent
Taxonomic class: Euic Typic Borohemists

Typical Pedon

Rifle mucky peat, 2,100 feet north and 200 feet west of the southeast corner of sec. 31, T. 140 N., R. 40 W.

Oe1—0 to 14 inches; mucky peat, dark reddish brown (5YR 2/2) broken face and rubbed; about 70 percent fiber unrubbed, about 20 percent rubbed; massive; primarily herbaceous fibers; moderately acid; clear smooth boundary.

Oe2—14 to 40 inches; mucky peat, dark reddish brown (5YR 3/2) broken face and rubbed; about 70 percent fiber unrubbed, about 30 percent rubbed; massive; primarily herbaceous fibers; moderately acid; clear smooth boundary.

Oe3—40 to 60 inches; mucky peat, dark reddish brown (5YR 3/2) broken face and rubbed; about 65 percent fiber unrubbed, about 25 percent rubbed;

massive; primarily herbaceous fibers; moderately acid.

Range in Characteristics

Thickness of the organic material: Greater than 51 inches
Content of wood fragments: 0 to 15 percent
Surface tier:
Hue—5YR, 7.5YR, or 10YR
Value—2 to 6
Chroma—1 to 4
Texture—mucky peat
Subsurface and bottom tiers:
Hue—5YR, 7.5YR, or 10YR
Value—2 to 5
Chroma—2 to 5
Texture—mucky peat

541—Rifle mucky peat

Composition

Rifle and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Mucky peat
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 31.8 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Smiley and similar soils
- Egglake and similar soils
- Forada and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

Rockwell Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate to rapid; lower part—moderate or moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits and till
Slope range: 0 to 1 percent
Taxonomic class: Coarse-loamy, frigid Typic Calciaquolls

Typical Pedon

Rockwell loam, 180 feet east and 1,100 feet north of the southwest corner of sec. 34, T. 142 N., R. 43 W.

Ap—0 to 12 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; strongly effervescent; slightly alkaline; clear smooth boundary.

Ak—12 to 18 inches; very dark gray (N 3/0) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; violently effervescent with lime disseminated throughout; slightly alkaline; clear smooth boundary.

Bkg—18 to 25 inches; light brownish gray (2.5Y 6/2) fine sandy loam; weak very fine subangular blocky structure; very friable; common fine distinct light yellowish brown (2.5Y 6/4) and olive yellow (2.5Y 5/6) iron concentrations; violently effervescent with lime disseminated throughout; moderately alkaline; clear smooth boundary.

2Cg1—25 to 32 inches; grayish brown (2.5Y 5/2) loamy fine sand; single grain; common medium distinct yellowish brown (10YR 5/6 and 5/8) iron concentrations; loose; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

3Cg2—32 to 60 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; common fine prominent yellowish brown (10YR 5/8) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 18 inches
Thickness of the lacustrine sediments: 20 to 40 inches
Carbonates: Occurring throughout the profile

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam
Content of rock fragments—none

Bkg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, loam, or loamy sand
Content of rock fragments—none

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 to 3
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of rock fragments—none

3Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam or clay loam
Content of rock fragments—1 to 8 percent

63—Rockwell loam

Composition

Rockwell and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wolverton and similar soils
- Hamerly and similar soils
- Wyndmere and similar soils
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Rockwood Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic class: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Rockwood sandy loam, 2 to 6 percent slopes, stony, 700 feet south and 1,700 feet west of the northeast corner of sec. 15, T. 138 N., R. 36 W.

A—0 to 4 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; about 10 percent gravel; slightly acid; clear smooth boundary.

E—4 to 14 inches; brown (10YR 5/3) sandy loam, light gray (10YR 7/2) dry; weak medium platy structure; friable; about 8 percent gravel; slightly acid; clear wavy boundary.

B/E—14 to 19 inches; 60 percent dark yellowish brown (10YR 4/4) sandy clay loam (Bt) and 40 percent brown (10YR 5/3) sandy loam (E); weak medium subangular blocky structure; friable; few thin clay films on faces of peds and in pores; about 8 percent gravel; slightly acid; clear smooth boundary.

Bt—19 to 30 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; many thick dark brown (10YR 3/3) clay films on faces of peds and in pores; about 6 percent gravel; slightly acid; clear smooth boundary.

BC—30 to 45 inches; light yellowish brown (10YR 6/4) sandy loam; weak thin platy soil aggregates; friable;

many light gray (10YR 7/2) filaments and threads of segregated lime; about 6 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cd—45 to 60 inches; light yellowish brown (10YR 6/4) sandy loam; weak thin platy soil aggregates; firm; few light gray (10YR 7/2) filaments and threads of segregated lime; about 6 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches
Content of rock fragments: 2 to 15 percent
Depth to dense till: 40 to 60 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam or loamy sand

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—sandy loam or sandy clay loam

Cd horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—sandy loam

1319B—Rockwood sandy loam, 2 to 6 percent slopes, stony

Composition

Rockwood and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Back slopes and shoulders
Slope range: 2 to 6 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Blowers and similar soils
- Paddock and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1319C—Rockwood sandy loam, 6 to 12 percent slopes, stony

Composition

Rockwood and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Blowers and similar soils
- Paddock and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1319D—Rockwood sandy loam, 12 to 20 percent slopes, stony

Composition

Rockwood and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Blowers and similar soils
- Paddock and similar soils
- Runeberg and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rosy Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 0 to 3 percent
Taxonomic class: Coarse-loamy, mixed Glossaquic Eutroboralfs

Typical Pedon

Rosy sandy loam, 1,700 feet south and 900 feet east of the northwest corner of sec. 34, T. 138 N., R. 36 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; about 1 percent gravel; moderately acid; abrupt smooth boundary.

E—9 to 18 inches; brown (10YR 5/3) loamy fine sand, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; very friable; about 1 percent gravel; slightly acid; clear smooth boundary.

B/E—18 to 20 inches; about 60 percent brown (10YR 5/3) loamy fine sand (E) and about 40 percent dark yellowish brown (10YR 4/4) sandy loam (Bt); weak fine subangular blocky structure; very friable; about 1 percent gravel; slightly acid; clear smooth boundary.

Bt—20 to 26 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine distinct light brownish gray (10YR 6/2) iron depletions and few medium distinct yellowish brown (10YR 5/6) iron concentrations; few thin dark brown (10YR 3/3) clay films on faces of peds and in pores; about 1 percent gravel; slightly acid; clear smooth boundary.

2E and Bt—26 to 37 inches; yellowish brown (10YR 5/4) loamy fine sand (E) and dark yellowish brown (10YR 4/4) fine sandy loam (Bt); weak and moderate subangular blocky structure; very friable (E) and friable (Bt); few fine distinct light brownish gray (10YR 6/2) iron depletions and few medium distinct yellowish brown (10YR 5/6) iron concentrations; common thin clay coatings on sand grains and clay bridging between sand grains;

slightly acid; clear smooth boundary.

2C—37 to 60 inches; light olive brown (2.5Y 5/4) loamy fine sand; massive; very friable; few fine distinct light brownish gray (2.5Y 6/2) iron depletions and few fine distinct yellowish brown (10YR 5/6) iron concentrations; slightly acid.

Range in Characteristics

Depth to carbonates: 29 to 60 inches
Content of rock fragments: 0 to 3 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3; 3 to 5 in the Ap horizon
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—very fine sandy loam, fine sandy loam, loam, sandy loam, or silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 4
Texture—loam, fine sandy loam, very fine sandy loam, silt loam, or sandy loam

2E and Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—loamy fine sand and fine sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—stratified sandy loam, loamy sand, loamy fine sand, fine sandy loam, very fine sandy loam, loam, or silt loam

624—Rosy sandy loam

Composition

Rosy and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Balmlake and similar soils
- Dalbo and similar soils
- Hillview and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Runeberg Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate or moderately slow; lower part—slow or moderately slow
Landform: Drumlins
Parent material: Till
Slope range: 0 to 1 percent
Taxonomic class: Coarse-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Runeberg mucky loam, depressional, 2,790 feet north and 2,380 feet west of the southeast corner of sec. 13, T. 137 N., R. 36 W., in Otter Tail County, Minnesota:

A—0 to 10 inches; black (N 2/0) mucky loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bg1—10 to 14 inches; dark gray (10YR 4/1) loam; weak medium subangular blocky structure; friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Bg2—14 to 21 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; firm; common medium prominent brown (7.5YR 5/4) and strong brown (7.5YR 5/6) iron concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Bg3—21 to 36 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; firm; common coarse prominent strong brown (7.5YR 5/6) iron concentrations; about 1 percent gravel; slightly alkaline; clear smooth boundary.

Cg1—36 to 48 inches; light brownish gray (2.5Y 6/2) sandy loam; massive; firm; few medium prominent strong brown (7.5YR 5/6) iron concentrations; about 1 percent gravel; few white (10YR 8/2) carbonate concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg2—48 to 60 inches; light olive gray (5Y 6/2) sandy loam; massive; firm; few fine prominent yellowish brown (10YR 5/6) iron concentrations; about 2 percent gravel; few white (10YR 8/2) carbonate concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 36 inches
Thickness of the mollic epipedon: 8 to 15 inches
Content of rock fragments: 3 to 15 percent

A or Ap horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—mucky loam

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or loam

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 to 3
Texture—sandy loam

701—Runeberg mucky loam, depressional

Composition

Runeberg and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions between drumlins
Slope range: 0 to 1 percent

Component Description

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: At the surface to 1 foot above the surface
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Paddock and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

Rushlake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Beach ridges
Parent material: Beach deposits
Slope range: 0 to 3 percent
Taxonomic class: Mixed, frigid Aquic Udipsamments

Typical Pedon

Rushlake loamy sand, in an area of Rushlake and Hangaard soils, lake beaches, 1,800 feet west and 1,500 feet south of the northeast corner of sec. 8, T. 138 N., R. 41 W.

A—0 to 7 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; about 2 percent gravel; neutral; clear smooth boundary.

BC—7 to 19 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; common carbonate coatings on the underside of pebbles; about 15 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

C—19 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand; single grain; loose; few

carbonate coatings on the underside of pebbles; about 20 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand
Content of rock fragments—0 to 15 percent gravel

BC or Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 8
Texture—sand, loamy sand, coarse sand, or loamy coarse sand
Content of rock fragments—10 to 35 percent gravel

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

1138—Rushlake and Hangaard soils, lake beaches

Composition

Rushlake: Variable
Hangaard: Variable
Inclusions: About 10 percent

Setting

Landform: Beach ridges
Slope range: Rushlake—0 to 3 percent; Hangaard—0 to 2 percent

Component Description

Rushlake
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderate

Hangaard
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Abbeylake and similar soils
- Two Inlets and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sandberg Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Upper part—moderately rapid; lower part—very rapid
Landform: Moraines, outwash plains, and valley trains
Parent material: Glacial outwash
Slope range: 2 to 20 percent
Taxonomic class: Sandy, mixed Udorthentic Haploborolls

Typical Pedon

Sandberg coarse sandy loam (fig. I-13), in an area of Arvilla-Sandberg complex, 2 to 6 percent slopes, 700 feet west and 1,300 feet south of the northeast corner of sec. 29, T. 138 N., R. 43 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) coarse sandy loam, very dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; about 5 percent gravel; neutral; abrupt smooth boundary.

Bw—8 to 15 inches; dark brown (10YR 3/3) gravelly

loamy coarse sand; weak fine subangular blocky structure; very friable; about 15 percent gravel; neutral; clear smooth boundary.

Bk—15 to 36 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 25 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

C—36 to 60 inches; pale brown (10YR 6/3) gravelly coarse sand; single grain; loose; about 25 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 40 inches
Thickness of the mollic epipedon: 7 to 16 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—coarse sandy loam
Content of rock fragments—3 to 25 percent gravel

Bw horizon (if it occurs):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent gravel

Bk and C horizons:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent gravel

1242D—Sandberg-Arvilla complex, 12 to 20 percent slopes

Composition

Sandberg and similar soils: About 65 percent
Arvilla and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 12 to 20 percent

Component Description

Sandberg
Surface layer texture: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches
Organic matter content: Moderate

Arvilla
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Fordville and similar soils
- Darnen and similar soils
- Osakis and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sedgeville Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate; lower part—rapid
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, mixed, frigid Fluvaquentic Endoaquolls

Typical Pedon

Sedgeville loam, frequently flooded, 1,300 feet east and

200 feet south of the northwest corner of sec. 3, T. 138 N., R. 38 W.

A—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; about 1 percent gravel; neutral; clear wavy boundary.

Cg1—8 to 17 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium subangular blocky soil aggregates; very friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations; about 5 percent gravel; neutral; clear wavy boundary.

Cg2—17 to 34 inches; grayish brown (2.5Y 5/2) coarse sandy loam; weak fine subangular blocky soil aggregates; very friable; few fine prominent strong brown (7.5YR 5/6) iron concentrations; about 10 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cg3—34 to 60 inches; grayish brown (2.5Y 5/2) gravelly loamy coarse sand; single grain; loose; few thin strata of dark grayish brown (2.5Y 4/2) sandy loam, sandy clay loam, and silt loam; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Content of rock fragments: 0 to 60 percent gravel
Depth to sandy alluvium: 24 to 40 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—loam

Cg horizon (loamy part):
Hue—7.5YR, 10YR, 2.5Y, 5Y, or neutral
Value—2 to 6
Chroma—0 to 4
Texture—silt loam, loam, sandy loam, coarse sandy loam, or fine sandy loam

Cg horizon (sandy part):
Hue—7.5YR, 10YR, 2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—sand, coarse sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or the gravelly or very gravelly analogs of these textures

1291—Sedgeville loam, frequently flooded

Composition

Sedgeville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Alluvium
Flooding: Frequent
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lamoure and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

Seelyeville Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landform: Moraines, outwash plains, and seeps
Parent material: Organic materials
Slope range: 0 to 10 percent
Taxonomic class: Euic Typic Borosaprists

Typical Pedon

Seelyeville muck, 250 feet east and 2,600 feet south of the northwest corner of sec. 18, T. 139 N., R. 40 W.

Oa1—0 to 24 inches; muck, very dark grayish brown (10YR 3/2) broken face and rubbed; about 30 percent fiber, about 3 percent rubbed; very friable; primarily herbaceous fibers; neutral; gradual smooth boundary.

Oa2—24 to 48 inches; muck, very dark gray (10YR 3/1) broken face and rubbed; about 35 percent fiber, about 2 percent rubbed; very friable; primarily herbaceous fibers; neutral; clear smooth boundary.

Oa3—48 to 60 inches; muck, very dark gray (10YR 3/1)

broken face and rubbed; about 30 percent fiber, about 1 percent rubbed; very friable; primarily herbaceous fibers; neutral.

Range in Characteristics

Thickness of the organic material: Greater than 51 inches
Fiber content: Less than 35 percent unrubbed; less than 16 percent rubbed
Thickness of hemic material in the subsurface and bottom tiers: Less than 10 inches
Oap, Ap, or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—muck
Oe horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—mucky peat

540—Seelyeville muck

Composition

Seelyeville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Winger and similar soils
- Smiley and similar soils
- Egglake and similar soils
- Epoufette and similar soils
- Forada and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

1825B—Seelyeville muck, seep land, 1 to 10 percent slopes

Composition

Seelyeville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Seeps (sidehill seeps)
Slope range: 1 to 10 percent

Component Description

Surface layer texture: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 2 feet below the surface
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Egglake and similar soils
- Forada and similar soils
- Epoufette and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Smiley Series

Depth class: Very deep

Drainage class: Poorly drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine-loamy, mixed, frigid Typic Argiaquolls

Typical Pedon

Smiley loam, 50 feet east and 400 feet north of the southwest corner of sec. 11, T. 138 N., R. 43 W.

A—0 to 13 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; about 2 percent gravel; neutral; clear smooth boundary.

Btg1—13 to 18 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate medium subangular blocky structure; friable; common fine distinct yellowish brown (10YR 5/6) iron concentrations; many thick very dark gray (10YR 3/1) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear smooth boundary.

Btg2—18 to 26 inches; dark grayish brown (2.5Y 4/2) clay loam; moderate medium subangular blocky structure; friable; common fine distinct yellowish brown (10YR 5/6) iron concentrations; common thick very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear smooth boundary.

Bkg—26 to 47 inches; light brownish gray (2.5Y 5/2) loam; weak fine subangular blocky structure; friable; common coarse distinct light olive brown (2.5Y 5/4) and common medium distinct yellowish brown (10YR 5/6) iron concentrations; many white (10YR 8/1) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg—47 to 60 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; common medium distinct light olive brown (2.5Y 5/4) and common fine faint (10YR 5/6) iron concentrations; few white (10YR 8/1) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 10 to 26 inches
Thickness of the mollic epipedon: 7 to 14 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—loam

Btg horizon:
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—1 to 3
Texture—clay loam or silty clay loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam

765—Smiley loam

Composition

Smiley and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section

Snellman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 35 percent
Taxonomic class: Fine-loamy, mixed Typic Eutroboralfs

Typical Pedon

Snellman sandy loam, 2 to 8 percent slopes (fig. I-14), 600 feet east and 1,300 feet north of the southwest corner of sec. 6, T. 139 N., R. 37 W.

A—0 to 2 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; about 3 percent gravel; slightly acid; abrupt smooth boundary.

E1—2 to 8 inches; brown (10YR 5/3) loamy sand, light gray (10YR 7/2) dry; weak thin platy structure; very friable; about 3 percent gravel; moderately acid; clear smooth boundary.

E2—8 to 16 inches; pale brown (10YR 6/3) loamy sand, white (10YR 8/1) dry; weak thin platy structure; very friable; about 3 percent gravel; moderately acid; clear wavy boundary.

Bt1—16 to 18 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; many thin light yellowish brown (10YR 6/4) sand and silt coatings on faces of peds and in pores; about 4 percent gravel; strongly acid; clear wavy boundary.

Bt2—18 to 31 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate coarse subangular blocky structure; friable; many thick very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 4 percent gravel; moderately acid; clear smooth boundary.

Bk—31 to 41 inches; light olive brown (2.5Y 5/4) sandy loam; moderate medium platy structure; friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—41 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; massive; friable; few light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Content of rock fragments: 2 to 15 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—sandy clay loam, loam, or sandy loam

Bk and C horizons:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—sandy loam, fine sandy loam, or loam

267B—Snellman sandy loam, 2 to 8 percent slopes

Composition

Snellman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nebish and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

267C—Snellman sandy loam, 8 to 15 percent slopes

Composition

Snellman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nebish and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

267E—Snellman sandy loam, 15 to 30 percent slopes

Composition

Snellman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nebish and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776B—Snellman-Sugarbush complex, 2 to 8 percent slopes

Composition

Snellman and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Two Inlets and similar soils
- Balmlake and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776C—Snellman-Sugarbush complex, 8 to 15 percent slopes

Composition

Snellman and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Two Inlets and similar soils
- Balmlake and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776E—Snellman-Sugarbush complex, 15 to 30 percent slopes

Composition

Snellman and similar soils: About 55 percent
Sugarbush and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Eagleview and similar soils
- Two Inlets and similar soils
- Balmlake and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sol Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic class: Fine-loamy, mixed Glossic Eutroboralfs

Typical Pedon

Sol sandy loam, 2 to 8 percent slopes, very stony, 2,350 feet west and 2,000 feet south of the northeast corner of sec. 22, T. 142 N., R. 37 W.

A—0 to 3 inches; very dark gray (10YR 3/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; about 5 percent gravel; neutral; clear smooth boundary.

E—3 to 15 inches; brown (10YR 5/3) loamy sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure; very friable; about 5 percent gravel; neutral; gradual wavy boundary.

E/B—15 to 17 inches; about 60 percent brown (10YR 5/3) loamy sand and 40 percent dark yellowish brown (10YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable; about 7 percent gravel; neutral; clear wavy boundary.

Bt—17 to 30 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; many thick dark brown (7.5YR 3/4) clay films on faces of peds and in pores; about 7 percent gravel; slightly acid; clear wavy boundary.

Bk—30 to 42 inches; light olive brown (2.5Y 5/4) sandy loam; weak medium platy structure; very friable; many light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; violently effervescent; slightly alkaline; gradual smooth boundary.

C—42 to 60 inches; light olive brown (2.5Y 5/3) sandy loam; weak medium platy soil aggregates; very friable; few light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 30 to 45 inches
Content of rock fragments: 2 to 10 percent

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 or 2
Texture—sandy loam

E horizon:
Hue—10YR
Value—5 or 6
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 to 5
Texture—sandy clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 5
Texture—sandy loam or fine sandy loam

1243B—Sol sandy loam, 2 to 8 percent slopes, very stony

Composition

Sol and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1243C—Sol sandy loam, 8 to 15 percent slopes, very stony

Composition

Sol and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1243E—Sol sandy loam, 15 to 30 percent slopes, very stony

Composition

Sol and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1244B—Sol-Sugarbush complex, 2 to 8 percent slopes, very stony

Composition

Sol and similar soils: About 65 percent
Sugarbush and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: Sol—2 to 8 percent; Sugarbush—1 to 8 percent

Component Description

Sol
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils
- Epoufette and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1244C—Sol-Sugarbush complex, 8 to 15 percent slopes, very stony

Composition

Sol and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Sol
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.5 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils
- Epoufette and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1244E—Sol-Sugarbush complex, 15 to 30 percent slopes, very stony

Composition

Sol and similar soils: About 55 percent
Sugarbush and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Sol
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: Moderate

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils

- Epoufette and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sugarbush Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid or rapid; next part—moderately rapid; lower part—very rapid
Landform: Moraines, outwash plains, and valley trains
Parent material: Glacial outwash
Slope range: 1 to 35 percent
Taxonomic class: Coarse-loamy, mixed Typic Eutroboralfs

Typical Pedon

Sugarbush sandy loam (fig. I-15), in an area of Sugarbush-Two Inlets complex, 1 to 8 percent slopes, 1,200 feet west and 1,100 feet south of the northeast corner of sec. 15, T. 142 N., R. 40 W.

A—0 to 3 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 3 percent gravel; moderately acid; clear smooth boundary.

E—3 to 13 inches; brown (10YR 5/3) loamy sand, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very friable; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bt—13 to 25 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; many distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; about 5 percent gravel; slightly acid; clear smooth boundary.

2C—25 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 10 percent gravel

E horizon:
Hue—10YR
Value—4 to 6
Chroma—3 or 4
Texture—loamy sand or loamy coarse sand
Content of rock fragments—0 to 10 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam or coarse sandy loam
Content of rock fragments—0 to 10 percent gravel

2C horizon:
Hue—7.5YR or 10YR
Value—5 or 6
Chroma—3 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—15 to 35 percent gravel

332B—Sugarbush sandy loam, 1 to 8 percent slopes

Composition

Sugarbush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils

- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

775B—Sugarbush-Two Inlets complex, 1 to 8 percent slopes

Composition

Sugarbush and similar soils: About 55 percent
Two Inlets and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

Two Inlets
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

775C—Sugarbush-Two Inlets complex, 8 to 15 percent slopes

Composition

Sugarbush and similar soils: About 50 percent
Two Inlets and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.3 inches
Organic matter content: Moderately low

Two Inlets
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Low

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1201C—Sugarbush-Snellman complex, 8 to 15 percent slopes

Composition

Sugarbush and similar soils: About 65 percent
Snellman and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.3 inches
Organic matter content: Moderately low

Snellman
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Eagleview and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1201E—Sugarbush-Snellman complex, 15 to 35 percent slopes

Composition

Sugarbush and similar soils: About 65 percent
Snellman and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 35 percent

Component Description

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderately low

Snellman
Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Eagleview and similar soils
- Wykeham and similar soils
- Karlstad and similar soils
- Egglake and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sverdrup Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 12 percent
Taxonomic class: Sandy, mixed Udic Haploborolls

Typical Pedon

Sverdrup sandy loam, in an area of Sverdrup-Abbeylake complex, 1 to 6 percent slopes, 2,600 feet north and 1,150 feet east of the southwest corner of sec. 19, T. 138 N., R. 41 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) sandy loam, very dark grayish brown (10YR 3/2) dry; weak very fine and fine subangular blocky structure; very friable; about 3 percent gravel; neutral; abrupt smooth boundary.

Bw1—10 to 17 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; about 3 percent gravel; slightly acid; clear smooth boundary.

2Bw2—17 to 25 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; about 4 percent gravel; neutral; clear smooth boundary.

2C—25 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 5 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 44 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 14 to 24 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 5 percent gravel

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—fine sandy loam, sandy loam, or loam
Content of rock fragments—0 to 5 percent gravel

2Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loamy fine sand, loamy sand, fine sand, or sand
Content of rock fragments—0 to 10 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—fine sand, sand, or coarse sand
Content of rock fragments—0 to 10 percent gravel

1125B—Sverdrup-Abbeylake complex, 1 to 6 percent slopes

Composition

Sverdrup and similar soils: About 70 percent
Abbeylake and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 6 percent

Component Description

Sverdrup
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: Moderate

Abbeylake
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Osakis and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1125C—Sverdrup-Abbeylake complex, 6 to 12 percent slopes

Composition

Sverdrup and similar soils: About 50 percent
Abbeylake and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 6 to 12 percent

Component Description

Sverdrup
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: Moderate

Abbeylake
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Darnen and similar soils
- Osakis and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sybil Series

Depth class: Very deep
Drainage class: Well drained

Permeability: Upper part—moderately rapid or rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 2 to 30 percent
Taxonomic class: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Sybil loamy sand, in an area of Sybil-Eagleview complex, 2 to 8 percent slopes, 3,850 feet north and 1,400 feet west of the southeast corner of sec. 16, T. 135 N., R. 39 W., in Otter Tail County, Minnesota:

Ap—0 to 5 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak fine and medium granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.

E—5 to 10 inches; dark yellowish brown (10YR 4/4) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; few fine roots; neutral; clear smooth boundary.

Bt1—10 to 15 inches; dark brown (7.5YR 4/4) sandy loam; moderate fine and medium subangular blocky structure; friable; few fine roots; common moderately thick dark brown (10YR 3/3) clay films on faces of peds and in pores; common distinct white (10YR 8/2) discontinuous sand coatings on faces of peds; neutral; clear smooth boundary.

Bt2—15 to 23 inches; dark brown (7.5YR 4/4) loamy sand; single grain; loose; few fine roots; common thin dark brown (7.5YR 3/4) clay coatings on sand grains and clay bridging between sand grains; neutral; gradual smooth boundary.

Bt3—23 to 32 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; common thin dark brown (7.5YR 4/4) clay coatings on sand grains and clay bridging between sand grains; neutral; gradual smooth boundary.

C—32 to 60 inches; brown (10YR 5/4) sand; single grain; loose; about 3 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Content of rock fragments: Less than 10 percent gravel throughout

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy coarse sand, or loamy fine sand

Bt horizon (upper part):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam, coarse sandy loam, or fine sandy loam

Bt horizon (lower part):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, or sand

2C horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—5 to 7
Chroma—2 to 6
Texture—sand or coarse sand

1195B—Sybil-Eagleview complex, 2 to 8 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Sybil
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Moderate

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1195C—Sybil-Eagleview complex, 8 to 15 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Sybil
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: Moderate

Eagleview
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1195E—Sybil-Eagleview complex, 15 to 30 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Sybil
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches
Organic matter content: Moderate

Eagleview
Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Friendship and similar soils
- Meehan and similar soils
- Epoufette and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Two Inlets Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderately rapid or rapid; lower part—very rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 1 to 30 percent
Taxonomic class: Sandy, mixed Psammentic Eutroboralfs

Typical Pedon

Two Inlets coarse sandy loam (fig. I-16), in an area of Two Inlets-Sugarbush complex, 15 to 30 percent slopes, 2,600 feet west and 25 feet south of the northeast corner of sec. 2, T. 141 N., R. 39 W.

A—0 to 2 inches; very dark gray (10YR 3/1) coarse sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; very friable; about 10 percent gravel; slightly acid; clear wavy boundary.

E—2 to 10 inches; dark yellowish brown (10YR 4/4) gravelly loamy coarse sand, brown (10YR 5/3) dry; single grain; loose; about 20 percent gravel; slightly acid; gradual wavy boundary.

Bt—10 to 33 inches; dark brown (7.5YR 4/4) gravelly loamy coarse sand; weak fine granular structure; very friable; about 25 percent gravel; common faint clay coatings on sand grains and clay bridging between sand grains; slightly acid; clear smooth boundary.

C—33 to 60 inches; light yellowish brown (10YR 6/4) gravelly coarse sand; single grain; loose; few carbonate coatings on the underside of pebbles; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—coarse sandy loam
Content of rock fragments—0 to 35 percent gravel

E horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—coarse sandy loam, loamy sand, loamy coarse sand, sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, loamy very coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent gravel

C horizon:
Hue—10YR
Value—4 to 6
Chroma—3 to 6
Texture—gravelly sand, gravelly coarse sand, or gravelly very coarse sand
Content of rock fragments—15 to 35 percent gravel

1238E—Two Inlets-Sugarbush complex, 15 to 30 percent slopes

Composition

Two Inlets and similar soils: About 55 percent
Sugarbush and similar soils: About 35 percent

Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Two Inlets
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Low

Sugarbush
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Karlstad and similar soils
- Epoufette and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1015—Udipsamments, cut and fill land

Composition

Udipsamments and similar soils: About 90 percent

Setting

Landform: Outwash plains, lake plains, and moraines
Slope range: 0 to 10 percent

Component Description

Surface layer texture: Sand
Depth class: Very deep (more than 60 inches)
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Very low

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1016—Udorthents, loamy, cut and fill land

Composition

Udorthents and similar soils: About 90 percent

Setting

Landform: Outwash plains, lake plains, and moraines
Slope range: 0 to 50 percent

Component Description

Surface layer texture: Variable
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Organic matter content: Very low

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1027—Udorthents, wet substratum, fill land

Composition

Udorthents and similar soils: About 90 percent

Setting

Landform: Outwash plains, lake plains, and moraines

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Urness Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow or moderate
Landform: Moraines and outwash plains
Parent material: Coprogenous earth
Slope range: 0 to 1 percent
Taxonomic class: Fine-silty, mixed (calcareous), frigid Mollic Fluvaquents

Typical Pedon

Urness mucky silt loam, 2,500 feet east and 800 feet south of the northwest corner of sec. 15, T. 140 N., R. 42 W.

Ap—0 to 7 inches; very dark gray (5Y 3/1) mucky silt loam (coprogenous earth); weak fine granular structure; very friable; about 5 percent snail-shell fragments; violently effervescent: moderately alkaline; abrupt smooth boundary.

C1—7 to 21 inches; dark gray (5Y 4/1) mucky silt loam (coprogenous earth); weak fine granular soil aggregates; very friable; about 10 percent snail-shell fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—21 to 34 inches; dark gray (5Y 4/1) mucky silt loam (coprogenous earth); weak fine granular soil aggregates; very friable; about 5 percent snail-shell fragments; violently effervescent; moderately alkaline; clear smooth boundary.

C3—34 to 45 inches; dark gray (5Y 4/1) silty clay loam (coprogenous earth); massive; friable; about 5 percent snail-shell fragments; strongly effervescent; slightly alkaline; gradual smooth boundary.

C4—45 to 60 inches; very dark gray (5Y 3/1) silt loam (coprogenous earth); massive; friable; about 5 percent snail-shell fragments; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the coprogenous earth sediments: 24 to 80 inches
Content of snail shells: 1 to 15 percent
Carbonates: Occurring throughout the profile

A and C horizons:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 to 4
Chroma—0 to 2
Texture—mucky silt loam
Content of rock fragments—none

2C horizon (if it occurs):
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silt loam, clay loam, or silty clay loam
Content of rock fragments—0 to 8 percent

335—Urness mucky silt loam

Composition

Urness and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Mucky silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Coprogenous earth
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rushlake and similar soils
- Hangaard and similar soils
- Vallers and similar soils
- Winger and similar soils
- Haslie and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

Vallers Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic class: Fine-loamy, frigid Typic Calciaquolls

Typical Pedon

Vallers silty clay loam, 2,450 feet east and 300 feet north of the southwest corner of sec. 32, T. 141 N., R. 43 W.

Akp—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; about 2 percent gravel; violently effervescent; slightly alkaline; abrupt smooth boundary.

Ak—9 to 15 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; violently effervescent; slightly alkaline; clear smooth boundary.

Bkg—15 to 23 inches; grayish brown (2.5Y 5/2) clay loam; weak medium subangular blocky structure; friable; few fine distinct olive yellow (2.5Y 6/6) iron concentrations; about 4 percent gravel; violently effervescent with lime disseminated throughout; slightly alkaline; gradual smooth boundary.

Cg1—23 to 39 inches; light brownish gray (2.5Y 6/2) clay loam; massive; friable; many fine distinct olive yellow (2.5Y 6/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—39 to 60 inches; light brownish gray (2.5Y 6/2) clay loam; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 9 to 18 inches
Carbonates: Occurring throughout the profile
Content of rock fragments: 2 to 8 percent

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6
Chroma—0 to 2
Texture—clay loam, silty clay loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7
Chroma—1 to 3
Texture—loam or clay loam

1317—Vallers silty clay loam

Composition

Vallers and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rims of depressions and flats on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Formdale and similar soils
• Hamerly and similar soils
• Quam and similar soils
• Hamre and similar soils
• Cathro and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

1997—Vallers-Hamerly-Winger complex

Composition

Vallers and similar soils: About 40 percent
Hamerly and similar soils: About 30 percent
Winger and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Vallers—rims of depressions and flats on moraines; Hamerly—flats and rises on moraines; Winger—depressions on moraines
Slope range: Vallers—0 to 2 percent; Hamerly—1 to 3 percent; Winger—0 to 1 percent

Component Description

Vallers
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.0 inches
Organic matter content: High

Hamerly
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

Winger
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Barnes and similar soils
- McIntosh and similar soils
- Winger soils that are not in depressions
- Quam and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Verndale Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid
Landform: Outwash plains and valley trains
Parent material: Glacial outwash
Slope range: 0 to 12 percent
Taxonomic class: Coarse-loamy, mixed Udic Argiborolls

Typical Pedon

Verndale sandy loam, 0 to 2 percent slopes, 2,100 feet west and 1,850 feet north of the southeast corner of sec. 21, T. 140 N., R. 36 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; about 2 percent gravel; strongly acid; abrupt smooth boundary.

Bt—8 to 15 inches; dark brown (7.5YR 4/4) sandy loam; moderate fine subangular blocky structure; friable; many thick dark brown (10YR 3/3) clay films on faces of peds and in pores; about 2 percent gravel; moderately acid; clear smooth boundary.

2Bw—15 to 33 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; about 8 percent gravel; neutral; gradual smooth boundary.

2C—33 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 4 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 24 to more than 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 14 to 22 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3

Chroma—1
Texture—coarse sandy loam
Content of rock fragments—0 to 8 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam, fine sandy loam, or loam
Content of rock fragments—0 to 8 percent gravel

2Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loamy sand, loamy coarse sand, sand, or coarse sand
Content of rock fragments—0 to 15 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—sand or coarse sand
Content of rock fragments—0 to 15 percent gravel

567A—Verndale sandy loam, 0 to 2 percent slopes

Composition

Verndale and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Abbeylake and similar soils
- Fordville and similar soils
- Oylen and similar soils
- Forada and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

567B—Verndale sandy loam, 2 to 6 percent slopes

Composition

Verndale and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 2 to 6 percent

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Abbeylake and similar soils
- Fordville and similar soils
- Oylen and similar soils
- Forada and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

1126B—Verndale-Nymore complex, 1 to 6 percent slopes

Composition

Verndale and similar soils: About 50 percent
Nymore and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 6 percent

Component Description

Verndale
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: Moderate

Nymore
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Fordville and similar soils
• Darnen and similar soils
• Oylen and similar soils
• Forada and similar soils
• The depressional Forada soils and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture
• Forest land

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section
• Forest Land section

1131B—Verndale-Abbeylake complex, 1 to 6 percent slopes

Composition

Verndale and similar soils: About 60 percent
Abbeylake and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Outwash plains and valley trains
Position on the landform: Back slopes and shoulders
Slope range: 1 to 6 percent

Component Description

Verndale
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: Moderate

Abbeylake
Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Fordville and similar soils

- Darnen and similar soils
- Oylen and similar soils
- Forada and similar soils
- The depressional Forada soils and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Waukon Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 30 percent
Taxonomic class: Fine-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Waukon loam, 8 to 15 percent slopes, 700 feet east and 400 feet north of the southwest corner of sec. 2, T. 138 N., R. 43 W.

A—0 to 5 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; about 3 percent gravel; neutral; clear smooth boundary.

E—5 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; weak thin platy structure; very friable; about 3 percent gravel; neutral; clear smooth boundary.

Bt—8 to 20 inches; dark brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; friable; many thick very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 3 percent gravel; neutral; clear wavy boundary.

Bk—20 to 32 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; many white (10YR 8/2) filaments and threads of segregated lime; about 5 percent gravel; violently effervescent; slightly alkaline; gradual smooth boundary.

C—32 to 60 inches; light yellowish brown (2.5Y 6/4) loam; massive; friable; few white (10YR 8/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 48 inches
Content of rock fragments: 2 to 8 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

E horizon:
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—loam, sandy loam, or fine sandy loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—loam or clay loam

38B—Waukon loam, 2 to 8 percent slopes

Composition

Waukon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 2 to 8 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Quam and similar soils
- Hamre and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

38C—Waukon loam, 8 to 15 percent slopes

Composition

Waukon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

38E—Waukon loam, 15 to 30 percent slopes

Composition

Waukon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 15 to 30 percent

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beltrami and similar soils
- Smiley and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1104B—Waukon-Dorset complex, 1 to 8 percent slopes

Composition

Waukon and similar soils: About 55 percent
Dorset and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 1 to 8 percent

Component Description

Waukon
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

Dorset
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Gonvick and similar soils
- Oylen and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1104C—Waukon-Dorset complex, 8 to 15 percent slopes

Composition

Waukon and similar soils: About 55 percent
Dorset and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Back slopes and shoulders
Slope range: 8 to 15 percent

Component Description

Waukon
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

Dorset
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Gonvick and similar soils
- Oylen and similar soils
- Smiley and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Winger Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderate; lower part—moderate or moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits and till
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, frigid Typic Calciaquolls

Typical Pedon

Winger silty clay loam, 200 feet south and 1,500 feet west of the northeast corner of sec. 23, T. 141 N., R. 43 W.

Ap—0 to 10 inches; black (10YR 2/1) silt clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; strongly effervescent with lime disseminated throughout; slightly alkaline; clear smooth boundary.

Bkg—15 to 37 inches; light brownish gray (2.5Y 6/2) silt loam; weak fine subangular blocky structure; friable; common medium distinct light olive brown (2.5Y 5/4) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg—37 to 60 inches; pale olive (5Y 6/3) clay loam; massive; friable; common medium prominent light gray (10YR 6/1) iron depletions and yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: Occurring throughout the profile
Thickness of the mollic epipedon: 8 to 24 inches
Depth to till: 24 to 40 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam or silty clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—silt loam or silty clay loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—loam or clay loam
Content of rock fragments—2 to 10 percent

398—Winger silty clay loam, depressional

Composition

Winger and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- McIntosh and similar soils
- Vallers and similar soils

• Rockwell and similar soils
• Hamre and similar soils
• Cathro and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

786—Winger-Hamerly-Colvin complex

Composition

Winger and similar soils: About 45 percent
Hamerly and similar soils: About 25 percent
Colvin and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Winger—rims of depressions and flats on moraines; Hamerly—flats and rises on moraines; Colvin—depressions on moraines
Slope range: Winger—0 to 2 percent; Hamerly—1 to 3 percent; Colvin—0 to 1 percent

Component Description

Winger
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 12.0 inches
Organic matter content: High

Hamerly
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

Colvin
Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Barnes and similar soils
• McIntosh and similar soils
• Hamre and similar soils
• Quam and similar soils

Major Uses of the Unit

• Cropland
• Hayland
• Pasture

For general and detailed information concerning these uses, see Part II of this publication:

• Agronomy section

1246—Winger silty clay loam

Composition

Winger and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Position on the landform: Toe slopes
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 12.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the

"Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- McIntosh and similar soils
- Colvin and similar soils
- Vallers and similar soils
- The depressional Colvin soils and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Wolverton Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid or rapid; lower part—moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits and till
Slope range: 0 to 2 percent
Taxonomic class: Coarse-loamy, frigid Aquic Calciborolls

Typical Pedon

Wolverton fine sandy loam, 2,200 feet north and 300 feet west of the southeast corner of sec. 22, T. 142 N., R. 42 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate fine granular structure parting to weak very fine subangular blocky; very friable; about 1 percent gravel; strongly effervescent with lime disseminated throughout; slightly alkaline; abrupt smooth boundary.

Bk1—8 to 12 inches; light olive brown (2.5Y 5/3) fine sandy loam; weak very fine subangular blocky structure; very friable; about 1 percent gravel; violently effervescent with lime disseminated throughout; moderately alkaline; gradual smooth boundary.

Bk2—12 to 41 inches; light olive brown (2.5Y 5/4) fine sandy loam; moderate medium granular structure; very friable; few fine distinct yellowish brown (10YR 5/6) iron concentrations and common medium faint light brownish gray (2.5Y 6/2) iron depletions; about 1 percent gravel; violently effervescent with lime disseminated throughout; moderately alkaline; abrupt wavy boundary.

2C—41 to 60 inches; light olive brown (2.5Y 5/3) clay loam; moderate fine subangular blocky soil aggregates; very friable; many coarse prominent dark yellowish brown (10YR 4/6) iron concentrations and common medium faint light brownish gray (2.5Y 6/2) iron depletions; few light gray (10YR 7/2) filaments and threads of segregated lime; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: Occurring throughout the profile
Thickness of the mollic epipedon: 7 to 16 inches
Depth to till: 20 to 50 inches
Content of rock fragments: Typically none in the glacial lacustrine sediments; 1 to 10 percent in the till sediments

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—loamy very fine sand, loamy fine sand, loamy sand, very fine sandy loam, fine sandy loam, or sandy loam

2C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—1 to 4
Texture—clay loam or loam

1130—Wolverton fine sandy loam

Composition

Wolverton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 0 to 2 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits and till
Flooding: None

Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egeland and similar soils
- Hamerly and similar soils
- Rockwell and similar soils
- The depressional Winger soils and similar soils
- Hamre and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Wykeham Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 3 percent
Taxonomic class: Fine-loamy, mixed Aquic Eutroboralfs

Typical Pedon

Wykeham fine sandy loam, 1,300 feet north and 1,800 feet east of the southwest corner of sec. 33, T. 138 N., R. 38 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; about 4 percent gravel; moderately acid; abrupt smooth boundary.

E/B—8 to 11 inches; about 90 percent grayish brown (10YR 5/2) sandy loam (E) and 10 percent dark brown (10YR 4/3) sandy loam (Bt); very pale brown (10YR 4/6) dry; weak medium platy structure; friable; about 4 percent gravel; slightly acid; clear smooth boundary.

Bt—11 to 21 inches; dark brown (10YR 4/3) sandy clay loam; weak medium subangular blocky structure; friable; common fine distinct dark yellowish brown (10YR 4/6) iron concentrations and few fine distinct grayish brown (2.5Y 4/2) iron depletions; many thin dark brown (10YR 3/3) clay films on faces of peds and in pores; about 5 percent gravel; neutral; clear smooth boundary.

Bk—21 to 33 inches; grayish brown (2.5Y 6/2) sandy loam; moderate medium platy structure; friable; common medium distinct light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—33 to 60 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium platy soil aggregates; friable; common medium distinct light yellowish brown (2.5Y 6/4) and common coarse distinct yellowish brown (10YR 5/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; about 7 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 50 inches
Content of rock fragments: 2 to 12 percent

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loamy fine sand, or loamy sand

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 8
Texture—sandy clay loam, loam, or sandy loam

Bk and C horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or fine sandy loam

121—Wykeham fine sandy loam

Composition

Wykeham and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1225—Wykeham-Karlstad complex

Composition

Wykeham and similar soils: About 60 percent
Karlstad and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Wykeham—flats and rises on moraines; Karlstad—flats and slight rises on outwash plains
Slope range: 1 to 3 percent

Component Description

Wykeham
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches
Organic matter content: High

Karlstad
Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Snellman and similar soils
- Friendship and similar soils
- Egglake and similar soils
- Epoufette and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Wyndmere Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 0 to 3 percent
Taxonomic class: Coarse-loamy, frigid Aeric Calciaquolls

Typical Pedon

Wyndmere fine sandy loam, 2,200 feet east and 300

feet north of the southwest corner of sec. 6, T. 141 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A—9 to 14 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—14 to 24 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; friable; violently effervescent with lime disseminated throughout; moderately alkaline; gradual smooth boundary.

C1—24 to 33 inches; light yellowish brown (2.5Y 5/4) fine sandy loam; massive; friable; strongly effervescent with lime disseminated throughout; moderately alkaline; gradual smooth boundary.

C2—33 to 53 inches; light yellowish brown (2.5Y 6/4) loamy fine sand; massive; very friable; common medium faint light brownish gray (2.5Y 6/2) iron depletions and olive yellow (2.5Y 6/6) iron concentrations; many light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—53 to 60 inches; light olive brown (2.5Y 5/4) silt loam; massive; friable; common medium distinct light brownish gray (2.5Y 6/2) iron depletions and olive yellow (2.5Y 6/6) iron concentrations; few light gray (10YR 7/2) filaments and threads of segregated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Carbonates: Occurring throughout the profile

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—fine sandy loam or sandy loam

C horizon:
Hue—10YR, 2.5Y or 5Y
Value—4 to 7
Chroma—2 to 4
Texture—silt loam, fine sandy loam, very fine sandy loam, loamy fine sand, loamy very fine sand, very fine sand, or fine sand

508—Wyndmere fine sandy loam

Composition

Wyndmere and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 0 to 3 percent

Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.6 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egeland and similar soils
- Hamerly and similar soils
- Rockwell and similar soils
- The depressional Winger soils and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

References

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Anderson, Curtis A. Pleistocene geology of the Comstock-Sebeka area, West-Central Minnesota. (Unpublished M.A. thesis, University of North Dakota, Grand Forks, 1976)

Clayton, Lee, and Stephen R. Moran. 1982. Chronology of Lake Wisconsin glaciation in middle North America. Quaternary Science Reviews 1: 55-82.

Fenton, Mark M., and others. 1983. Quaternary stratigraphy and history in the southern part of the Lake Agassiz basin. Geological Association of Canada Special Paper 26.

Hobbs, Howard C., and Joseph E. Goebel. 1982. Geologic map of Minnesota—Quaternary geology. Minnesota Geological Survey, University of Minnesota.

Jenny, Hans. 1941. Factors of soil formation.

Marshner, Francis J. 1974. The original vegetation of Minnesota. North Central Forest Experiment Station, map.

Norton, Arthur R. Quaternary geology of the Itaska-St. Croix Moraine Interlobate area, North-Central Minnesota. (Unpublished M.S. thesis, University of Minnesota, 1982)

Perkins, Roderic L. The late Cenozoic geology of West-Central Minnesota from Moorhead to Park Rapids. (Unpublished M.S. thesis, University of North Dakota, 1977)

Sackreiter, Donald Keith. Quaternary geology of the southern part of the Grand Forks and Bemidji Quadrangles. (Unpublished Ph.D. dissertation, University of North Dakota, Grand Forks, 1975)

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1982. National resources inventory.

United States Department of Agriculture. 1990. Minnesota agricultural statistics. Statistical Reporting Service and Minnesota Agricultural Statistics Service.

United States Department of Agriculture. 1993. Soil survey manual. U.S. Department of Agriculture Handbook 18.

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook. (Available in the State office of the Natural Resources Conservation Service, St. Paul, Minnesota)

Vandersluis, Charles. 1974. Mainly logging. Minnesota Clinic, pp. 298-302.

Wilcox, Alvin H. 1907. A pioneer history of Becker County.

Wright, H.E., Jr. 1962. Role of the Wadena Lobe in the Wisconsin Glaciation of Minnesota. Geological Society of America Bulletin 73: 73-100.

Wright, H.E., Jr. 1972a. Physiography of Minnesota. *In* Geology of Minnesota: A Centennial Volume.

Wright, H.E., Jr. 1972b. Quaternary history of Minnesota. *In* Geology of Minnesota: A Centennial Volume.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	more than 9

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the

hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at

least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate or high water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of most field crops are affected. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted under natural conditions. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under

natural conditions. Poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.
Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone,

slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter

represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay

content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk

density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10

Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in

stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Minnesota Agricultural
Experiment Station

Soil Survey of Becker County, Minnesota

Part II

This page intentionally left blank.

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, which is the color map preceding the detailed soil maps, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in November 1992. Soil names and descriptions were approved in February 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This survey was made cooperatively by the Natural Resources Conservation Service and the Minnesota Agricultural Experiment Station. Assistance was provided by the Agricultural Extension Service, the Minnesota Department of Natural Resources, and the Soil and Water Conservation Board. The survey was partially funded by the Legislative Commission for Minnesota Resources and by Becker County. It is part of the technical assistance furnished to the Becker County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of Formdale-Langhei-Flom soils.

Contents

Part I

Index to series iv
Index to map units v
Summary of tables ix
Foreword xi
How this survey was made 1
Survey procedures 2
General nature of the survey area 3
History 3
Logging history 4
Transportation facilities 4
Physiography and relief 5
Drainage 5
Geologic history 5
Water supply 6
Climate 6
General soil map units 9
Formation and classification of the soils 19
Soil series and detailed soil map units 29
References 171
Glossary 173

Part II (For page numbers, see Contents in Part II)

Detailed soil map unit legend
Summary of tables
Agronomy
Crops and pasture
Crop yield estimates
Land capability classification
Prime farmland
Erosion factors
Windbreaks and environmental plantings
Forest land
Recreation
Wildlife habitat
Engineering
Building site development
Sanitary facilities
Waste management
Construction materials
Water management
Soil properties
Engineering index properties
Physical and chemical properties
Water features
Soil features
References
Glossary

Issued 1998

Detailed Soil Map Unit Legend

20B—Chapett fine sandy loam, 2 to 8 percent slopes
20C2—Chapett fine sandy loam, 8 to 15 percent slopes, eroded
20E—Chapett fine sandy loam, 15 to 30 percent slopes
26—Aazdahl clay loam
33B—Barnes loam, 2 to 6 percent slopes
36—Flom silty clay loam
38B—Waukon loam, 2 to 8 percent slopes
38C—Waukon loam, 8 to 15 percent slopes
38E—Waukon loam, 15 to 30 percent slopes
40B—Nebish loam, 2 to 8 percent slopes
40C—Nebish loam, 8 to 15 percent slopes
40E—Nebish loam, 15 to 30 percent slopes
47—Colvin silty clay loam
63—Rockwell loam
108—McIntosh silt loam
111—Hangaard sandy loam
121—Wykeham fine sandy loam
125—Beltrami loam
133A—Dalbo silt loam, 0 to 2 percent slopes
133B—Dalbo silt loam, 2 to 8 percent slopes
133C—Dalbo silt loam, 8 to 15 percent slopes
133E—Dalbo silt loam, 15 to 30 percent slopes
137—Dovray silty clay
141B—Egeland fine sandy loam, 1 to 6 percent slopes
141C—Egeland fine sandy loam, 6 to 12 percent slopes
168B—Forman clay loam, 2 to 6 percent slopes
168C2—Forman clay loam, 6 to 12 percent slopes, eroded
168D2—Forman clay loam, 12 to 20 percent slopes, eroded
168E—Forman clay loam, 20 to 30 percent slopes
171B—Formdale clay loam, 2 to 5 percent slopes
180—Gonvick loam
184—Hamerly loam
191—Epoufette sandy loam
202—Meehan loamy sand
207D—Nymore loamy sand, 12 to 20 percent slopes
267B—Snellman sandy loam, 2 to 8 percent slopes
267C—Snellman sandy loam, 8 to 15 percent slopes
267E—Snellman sandy loam, 15 to 30 percent slopes
315A—Bootlake sandy loam, 0 to 2 percent slopes
315B—Bootlake sandy loam, 2 to 5 percent slopes
332B—Sugarbush sandy loam, 1 to 8 percent slopes
335—Urness mucky silt loam
339—Fordville loam
344—Quam silty clay loam
351—Colvin silty clay loam, depressional
375—Forada loam
398—Winger silty clay loam, depressional
406A—Dorset sandy loam, 0 to 2 percent slopes
406B—Dorset sandy loam, 2 to 6 percent slopes
413—Osakis sandy loam
418—Lamoure silty clay loam, occasionally flooded
422B—Bygland silty clay loam, 1 to 6 percent slopes
422C—Bygland silty clay loam, 6 to 15 percent slopes
503B—Balmlake fine sandy loam, 1 to 8 percent slopes
503C—Balmlake fine sandy loam, 8 to 15 percent slopes
503E—Balmlake fine sandy loam, 15 to 30 percent slopes
508—Wyndmere fine sandy loam
540—Seelyeville muck
541—Rifle mucky peat
544—Cathro muck
564—Friendship loamy sand
567A—Verndale sandy loam, 0 to 2 percent slopes
567B—Verndale sandy loam, 2 to 6 percent slopes
579C2—Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded
624—Rosy sandy loam
701—Runeberg mucky loam, depressional
711B—Arvilla-Sandberg complex, 2 to 6 percent slopes
711C—Arvilla-Sandberg complex, 6 to 12 percent slopes
718B—Naytahwaush loam, 2 to 8 percent slopes
718C—Naytahwaush loam, 8 to 15 percent slopes
718E—Naytahwaush loam, 15 to 30 percent slopes
721E—Corliss loamy sand, 20 to 35 percent slopes
746—Haslie muck
747B—Audubon silty clay loam, 0 to 6 percent slopes
753D—Abbeylake loamy sand, 12 to 20 percent slopes

753E—Abbeylake loamy sand, 20 to 30 percent slopes
765—Smiley loam
767—Auganaush loam
775B—Sugarbush-Two Inlets complex, 1 to 8 percent slopes
775C—Sugarbush-Two Inlets complex, 8 to 15 percent slopes
776B—Snellman-Sugarbush complex, 2 to 8 percent slopes
776C—Snellman-Sugarbush complex, 8 to 15 percent slopes
776E—Snellman-Sugarbush complex, 15 to 30 percent slopes
778B—Dorset-Corliss complex, 1 to 6 percent slopes
778C—Dorset-Corliss complex, 6 to 12 percent slopes
780B—Audubon-Boyerlake complex, 1 to 6 percent slopes
780C2—Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded
780D2—Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded
785—Hamerly-Winger complex
786—Winger-Hamerly-Colvin complex
797—Mooselake and Lupton soils
867B—Graycalm-Menahga complex, 1 to 8 percent slopes
867C—Graycalm-Menahga complex, 8 to 15 percent slopes
867E—Graycalm-Menahga complex, 15 to 30 percent slopes
903B—Barnes-Langhei complex, 2 to 6 percent slopes
903C2—Barnes-Langhei complex, 6 to 12 percent slopes, eroded
931C2—Formdale-Langhei complex, 6 to 12 percent slopes, eroded
942D2—Langhei-Barnes complex, 12 to 20 percent slopes, eroded
943D2—Langhei-Formdale complex, 12 to 20 percent slopes, eroded
943E—Langhei-Formdale complex, 20 to 30 percent slopes
951B—Nebish-Sugarbush complex, 2 to 8 percent slopes
951C—Nebish-Sugarbush complex, 8 to 15 percent slopes
951E—Nebish-Sugarbush complex, 15 to 30 percent slopes
1015—Udipsamments, cut and fill land
1016—Udorthents, loamy, cut and fill land
1027—Udorthents, wet substratum, fill land
1030—Pits, gravel-Udipsamments complex
1104B—Waukon-Dorset complex, 1 to 8 percent slopes
1104C—Waukon-Dorset complex, 8 to 15 percent slopes
1111—Nidaros muck, frequently flooded
1113—Haslie, Seelyeville, and Cathro soils, ponded
1125B—Sverdrup-Abbeylake complex, 1 to 6 percent slopes
1125C—Sverdrup-Abbeylake complex, 6 to 12 percent slopes
1126B—Verndale-Nymore complex, 1 to 6 percent slopes
1127A—Bootlake-Graycalm complex, 0 to 2 percent slopes
1127B—Bootlake-Graycalm complex, 2 to 8 percent slopes
1128—Cathro muck, frequently flooded
1129—Lindaas silty clay loam, morainic
1130—Wolverton fine sandy loam
1131B—Verndale-Abbeylake complex, 1 to 6 percent slopes
1132B—Eagleview-Balmlake complex, 1 to 8 percent slopes
1132C—Eagleview-Balmlake complex, 8 to 15 percent slopes
1132E—Eagleview-Balmlake complex, 15 to 30 percent slopes
1135—Foxlake silty clay loam
1136—Nidaros muck
1137B—Birchlake silty clay loam, 1 to 6 percent slopes

1137C—Birchlake silty clay loam, 6 to 12 percent slopes, eroded
1137D—Birchlake silty clay loam, 12 to 20 percent slopes, eroded
1137E—Birchlake silty clay loam, 20 to 30 percent slopes
1138—Rushlake and Hangaard soils, lake beaches
1140B—Eagleview-Snellman complex, 1 to 8 percent slopes
1140C—Eagleview-Snellman complex, 8 to 15 percent slopes
1149—Hamerly clay loam
1195B—Sybil-Eagleview complex, 2 to 8 percent slopes
1195C—Sybil-Eagleview complex, 8 to 15 percent slopes
1195E—Sybil-Eagleview complex, 15 to 30 percent slopes
1196B—Lida-Two Inlets complex, 1 to 8 percent slopes
1196C—Lida-Two Inlets complex, 8 to 15 percent slopes
1196E—Lida-Two Inlets complex, 15 to 30 percent slopes
1200—Egglake loam
1201C—Sugarbush-Snellman complex, 8 to 15 percent slopes
1201E—Sugarbush-Snellman complex, 15 to 35 percent slopes
1210—Paddock-Epoufette complex
1211—Egglake-Cathro complex
1225—Wykeham-Karlstad complex
1227—Quam, Cathro, and Urness soils, ponded
1230—Haslie and Nidaros soils, ponded
1234B—Formdale-Buse complex, 2 to 6 percent slopes
1235B—Formdale-Buse-Sandberg complex, 2 to 6 percent slopes
1236B—Eagleview loamy sand, 1 to 8 percent slopes
1236C—Eagleview loamy sand, 8 to 15 percent slopes
1236E—Eagleview loamy sand, 15 to 30 percent slopes
1238E—Two Inlets-Sugarbush complex, 15 to 30 percent slopes
1242D—Sandberg-Arvilla complex, 12 to 20 percent slopes
1243B—Sol sandy loam, 2 to 8 percent slopes, very stony
1243C—Sol sandy loam, 8 to 15 percent slopes, very stony
1243E—Sol sandy loam, 15 to 30 percent slopes, very stony
1244B—Sol-Sugarbush complex, 2 to 8 percent slopes, very stony
1244C—Sol-Sugarbush complex, 8 to 15 percent slopes, very stony
1244E—Sol-Sugarbush complex, 15 to 30 percent slopes, very stony
1246—Winger silty clay loam
1247D—Corliss-Dorset complex, 12 to 20 percent slopes
1248C—Nymore-Verndale complex, 6 to 12 percent slopes
1249C—Graycalm-Bootlake complex, 8 to 15 percent slopes
1250C—Abbeylake-Verndale complex, 6 to 12 percent slopes
1251—Lamoure silt loam, channeled, frequently flooded
1252B—Bootlake-Eagleview complex, 1 to 8 percent slopes
1263C—Eagleview-Bootlake complex, 8 to 15 percent slopes
1291—Sedgeville loam, frequently flooded
1306—Karlstad sandy loam
1317—Vallers silty clay loam
1318—Darnen loam
1319B—Rockwood sandy loam, 2 to 6 percent slopes, stony
1319C—Rockwood sandy loam, 6 to 12 percent slopes, stony
1319D—Rockwood sandy loam, 12 to 20 percent slopes, stony
1320B—Blowers sandy loam, 1 to 5 percent slopes, stony

1321—Paddock fine sandy loam, stony
1365—Hillview fine sandy loam
1825B—Seelyeville muck, seep land, 1 to 10 percent slopes
1878—Hamre muck
1938—Lakepark clay loam
1942—Forada mucky loam, depressional
1967—Hamerly-Vallers complex
1975—Oylen sandy loam
1997—Vallers-Hamerly-Winger complex

This page intentionally left blank.

Summary of Tables

Part I

Temperature and precipitation 7
Freeze dates in spring and fall 8
Growing season 8
Classification of the soils 23
Acreage and proportionate extent of the soils 25

Part II

(Page numbers are in the Summary of Tables in Part II)

Classification of the soils
Acreage and proportionate extent of the soils
Cropland management considerations
Land capability and yields per acre of crops and pasture
Prime farmland
Windbreaks and environmental plantings
Windbreak suitability groups
Forest land harvest equipment considerations
Forest haul road considerations
Forest log landing considerations
Forest land site preparation and planting considerations
Recreational development
Wildlife habitat
Building site development
Sanitary facilities
Construction materials
Water management
Engineering index properties
Physical properties of the soils
Chemical properties of the soils
Water features
Soil features

This page intentionally left blank.

Soil Survey of
Becker County, Minnesota

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this survey can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aazdahl	Aquic Haploborolls, fine-loamy, mixed
Abbeylake	Typic Udipsamments, mixed, frigid
Arvilla	Udic Haploborolls, sandy, mixed
Audubon	Vertic Haploborolls, fine, montmorillonitic
Auganaush	Mollic Albaqualfs, fine, montmorillonitic, frigid
Balmlake	Typic Eutroboralfs, coarse-loamy, mixed
Barnes	Udic Haploborolls, fine-loamy, mixed
Beltrami	Aquic Eutroboralfs, fine-loamy, mixed
Birchlake	Aquic Argiborolls, fine, montmorillonitic
Blowers	Glossaquic Eutroboralfs, coarse-loamy, mixed
Bootlake	Typic Eutroboralfs, coarse-loamy, mixed
Boyerlake	Vertic Eutrochrepts, fine, montmorillonitic, frigid
Buse	Typic Calciborolls, fine-loamy, mixed
Bygland	Aquertic Argiborolls, fine, montmorillonitic
Cathro	Terric Borosaprists, loamy, mixed, euic
Chapett	Boralfic Udic Argiborolls, fine-loamy, mixed
Colvin	Typic Calciaquolls, fine-silty, frigid
Corliss	Typic Udipsamments, mixed, frigid
Dalbo	Vertic Eutroboralfs, fine, montmorillonitic
Darnen	Pachic Udic Haploborolls, fine-loamy, mixed
Dorset	Udic Argiborolls, coarse-loamy, mixed
Dovray	Cumulic Vertic Epiaquolls, fine, montmorillonitic, frigid
Eagleview	Argic Udipsamments, mixed, frigid
Egeland	Udic Haploborolls, coarse-loamy, mixed
Egglake	Mollic Endoaqualfs, fine-loamy, mixed, frigid
Epoufette	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Flom	Typic Endoaquolls, fine-loamy, mixed, frigid
Forada	Typic Endoaquolls, coarse-loamy, mixed, frigid
Fordville	Pachic Udic Haploborolls, fine-loamy over sandy or sandy-skeletal, mixed
Forman	Udic Argiborolls, fine-loamy, mixed
Formdale	Udic Haploborolls, fine-loamy, mixed
Foxlake	Vertic Epiaquolls, fine, montmorillonitic, frigid
Friendship	Typic Udipsamments, mixed, frigid
Gonvick	Aquic Argiborolls, fine-loamy, mixed
Graycalm	Argic Udipsamments, mixed, frigid
Hamerly	Aeric Calciaquolls, fine-loamy, frigid
Hamre	Histic Humaquepts, fine-loamy, mixed, nonacid, frigid
Hangaard	Typic Endoaquolls, sandy, mixed, frigid
Haslie	Limnic Borosaprists, coprogenous, euic
Hillview	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Karlstad	Aquic Eutroboralfs, coarse-loamy, mixed
Lakepark	Cumulic Endoaquolls, fine-loamy, mixed, frigid
Lamoure	Cumulic Endoaquolls, fine-silty, mixed (calcareous), frigid
Langhei	Typic Eutrochrepts, fine-loamy, mixed, frigid
Lida	Mollic Eutroboralfs, coarse-loamy, mixed
Lindaas	Typic Argiaquolls, fine, montmorillonitic, frigid
Lupton	Typic Borosaprists, euic
McIntosh	Aeric Calciaquolls, fine-silty, frigid
Meehan	Aquic Udipsamments, mixed, frigid
Menahga	Typic Udipsamments, mixed, frigid
Mooselake	Typic Borohemists, euic
Naytahwaush	Mollic Eutroboralfs, fine, montmorillonitic
Nebish	Typic Eutroboralfs, fine-loamy, mixed
Nidaros	Terric Borosaprists, loamy, mixed, euic
Nymore	Typic Udipsamments, mixed, frigid
Osakis	Aquic Haploborolls, sandy, mixed
Oylen	Aquic Argiborolls, coarse-loamy, mixed
Paddock	Udollic Epiaqualfs, coarse-loamy, mixed, frigid
Quam	Cumulic Endoaquolls, fine-silty, mixed, frigid
Rifle	Typic Borohemists, euic
Rockwell	Typic Calciaquolls, coarse-loamy, frigid
Rockwood	Mollic Eutroboralfs, coarse-loamy, mixed
Rosy	Glossaquic Eutroboralfs, coarse-loamy, mixed
Runeberg	Typic Endoaquolls, coarse-loamy, mixed, frigid
Rushlake	Aquic Udipsamments, mixed, frigid

CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Sandberg	Udorthentic Haploborolls, sandy, mixed
Sedgeville	Fluvaquentic Endoaquolls, coarse-loamy, mixed, frigid
Seelyeville	Typic Borosaprists, euic
Smiley	Typic Argiaquolls, fine-loamy, mixed, frigid
Snellman	Typic Eutroboralfs, fine-loamy, mixed
Sol	Glossic Eutroboralfs, fine-loamy, mixed
Sugarbush	Typic Eutroboralfs, coarse-loamy, mixed
Sverdrup	Udic Haploborolls, sandy, mixed
Sybil	Mollic Eutroboralfs, sandy, mixed
Two Inlets	Psammentic Eutroboralfs, sandy, mixed
Udipsamments	Udipsamments
Udorthents	Udorthents
Urness	Mollic Fluvaquents, fine-silty, mixed (calcareous), frigid
Vallers	Typic Calciaquolls, fine-loamy, frigid
Verndale	Udic Argiborolls, coarse-loamy, mixed
Waukon	Mollic Eutroboralfs, fine-loamy, mixed
Winger	Typic Calciaquolls, fine-silty, frigid
Wolverton	Aquic Calciborolls, coarse-loamy, mixed
Wykeham	Aquic Eutroboralfs, fine-loamy, mixed
Wyndmere	Aeric Calciaquolls, coarse-loamy, frigid

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
20B	Chapett fine sandy loam, 2 to 8 percent slopes	1,730	0.2
20C2	Chapett fine sandy loam, 8 to 15 percent slopes, eroded	1,880	0.2
20E	Chapett fine sandy loam, 15 to 30 percent slopes	680	*
26	Aazdahl clay loam	3,110	0.3
33B	Barnes loam, 2 to 6 percent slopes	1,740	0.2
36	Flom silty clay loam	5,620	0.6
38B	Waukon loam, 2 to 8 percent slopes	6,730	0.7
38C	Waukon loam, 8 to 15 percent slopes	5,710	0.6
38E	Waukon loam, 15 to 30 percent slopes	2,300	0.3
40B	Nebish loam, 2 to 8 percent slopes	8,280	0.9
40C	Nebish loam, 8 to 15 percent slopes	9,650	1.0
40E	Nebish loam, 15 to 30 percent slopes	3,470	0.4
47	Colvin silty clay loam	940	0.1
63	Rockwell loam	2,390	0.2
108	McIntosh silt loam	3,820	0.4
111	Hangaard sandy loam	1,090	0.1
121	Wykeham fine sandy loam	3,820	0.4
125	Beltrami loam	4,380	0.5
133A	Dalbo silt loam, 0 to 2 percent slopes	3,620	0.4
133B	Dalbo silt loam, 2 to 8 percent slopes	3,280	0.4
133C	Dalbo silt loam, 8 to 15 percent slopes	1,330	0.2
133E	Dalbo silt loam, 15 to 30 percent slopes	280	*
137	Dovray silty clay	800	*
141B	Egeland fine sandy loam, 1 to 6 percent slopes	980	0.1
141C	Egeland fine sandy loam, 6 to 12 percent slopes	310	*
168B	Forman clay loam, 2 to 6 percent slopes	2,770	0.3
168C2	Forman clay loam, 6 to 12 percent slopes, eroded	3,110	0.3
168D2	Forman clay loam, 12 to 20 percent slopes, eroded	1,310	0.2
168E	Forman clay loam, 20 to 30 percent slopes	250	*
171B	Formdale clay loam, 2 to 5 percent slopes	8,580	0.9
180	Gonvick loam	810	*
184	Hamerly loam	10,330	1.1
191	Epoufette sandy loam	3,070	0.3
202	Meehan loamy sand	1,140	0.1
207D	Nymore loamy sand, 12 to 20 percent slopes	690	*
267B	Snellman sandy loam, 2 to 8 percent slopes	13,680	1.5
267C	Snellman sandy loam, 8 to 15 percent slopes	28,960	3.1
267E	Snellman sandy loam, 15 to 30 percent slopes	11,280	1.2
315A	Bootlake sandy loam, 0 to 2 percent slopes	370	*
315B	Bootlake sandy loam, 2 to 5 percent slopes	640	*
332B	Sugarbush sandy loam, 1 to 8 percent slopes	1,820	0.2
335	Urness mucky silt loam	3,760	0.4
339	Fordville loam	1,480	0.2
344	Quam silty clay loam	3,730	0.4
351	Colvin silty clay loam, depressional	1,090	0.1
375	Forada loam	3,360	0.4
398	Winger silty clay loam, depressional	2,380	0.2
406A	Dorset sandy loam, 0 to 2 percent slopes	3,610	0.4
406B	Dorset sandy loam, 2 to 6 percent slopes	8,730	0.9
413	Osakis sandy loam	560	*
418	Lamoure silty clay loam, occasionally flooded	1,510	0.2
422B	Bygland silty clay loam, 1 to 6 percent slopes	1,420	0.2
422C	Bygland silty clay loam, 6 to 15 percent slopes	290	*
503B	Balmlake fine sandy loam, 1 to 8 percent slopes	1,770	0.2
503C	Balmlake fine sandy loam, 8 to 15 percent slopes	700	*
503E	Balmlake fine sandy loam, 15 to 30 percent slopes	400	*
508	Wyndmere fine sandy loam	980	0.1
540	Seelyeville muck	15,580	1.7
541	Rifle mucky peat	51,540	5.6
544	Cathro muck	14,730	1.6
564	Friendship loamy sand	2,610	0.3
567A	Verndale sandy loam, 0 to 2 percent slopes	11,750	1.3
567B	Verndale sandy loam, 2 to 6 percent slopes	5,050	0.5

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
579C2	Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded	920	*
624	Rosy sandy loam	850	*
701	Runeberg mucky loam, depressional	2,400	0.2
711B	Arvilla-Sandberg complex, 2 to 6 percent slopes	5,960	0.6
711C	Arvilla-Sandberg complex, 6 to 12 percent slopes	8,200	0.9
718B	Naytahwaush loam, 2 to 8 percent slopes	820	*
718C	Naytahwaush loam, 8 to 15 percent slopes	1,110	0.1
718E	Naytahwaush loam, 15 to 30 percent slopes	460	*
721E	Corliss loamy sand, 20 to 35 percent slopes	690	*
746	Haslie muck	16,410	1.8
747B	Audubon silty clay loam, 0 to 6 percent slopes	3,860	0.4
753D	Abbeylake loamy sand, 12 to 20 percent slopes	900	*
753E	Abbeylake loamy sand, 20 to 30 percent slopes	910	*
765	Smiley loam	3,640	0.4
767	Auganaush loam	110	*
775B	Sugarbush-Two Inlets complex, 1 to 8 percent slopes	18,850	2.0
775C	Sugarbush-Two Inlets complex, 8 to 15 percent slopes	20,990	2.3
776B	Snellman-Sugarbush complex, 2 to 8 percent slopes	18,810	2.0
776C	Snellman-Sugarbush complex, 8 to 15 percent slopes	35,090	3.8
776E	Snellman-Sugarbush complex, 15 to 30 percent slopes	18,250	2.0
778B	Dorset-Corliss complex, 1 to 6 percent slopes	6,640	0.7
778C	Dorset-Corliss complex, 6 to 12 percent slopes	4,880	0.5
780B	Audubon-Boyerlake complex, 1 to 6 percent slopes	2,290	0.3
780C2	Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded	3,220	0.3
780D2	Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded	1,010	0.1
785	Hamerly-Winger complex	13,640	1.5
786	Winger-Hamerly-Colvin complex	11,370	1.2
797	Mooselake and Lupton soils	7,200	0.8
867B	Graycalm-Menahga complex, 1 to 8 percent slopes	3,210	0.3
867C	Graycalm-Menahga complex, 8 to 15 percent slopes	2,720	0.3
867E	Graycalm-Menahga complex, 15 to 30 percent slopes	1,840	0.2
903B	Barnes-Langhei complex, 2 to 6 percent slopes	6,840	0.7
903C2	Barnes-Langhei complex, 6 to 12 percent slopes, eroded	4,010	0.4
931C2	Formdale-Langhei complex, 6 to 12 percent slopes, eroded	17,010	1.8
942D2	Langhei-Barnes complex, 12 to 20 percent slopes, eroded	1,320	0.1
943D2	Langhei-Formdale complex, 12 to 20 percent slopes, eroded	4,560	0.5
943E	Langhei-Formdale complex, 20 to 30 percent slopes	690	*
951B	Nebish-Sugarbush complex, 2 to 8 percent slopes	3,020	0.3
951C	Nebish-Sugarbush complex, 8 to 15 percent slopes	2,790	0.3
951E	Nebish-Sugarbush complex, 15 to 30 percent slopes	820	*
1015	Udipsamments, cut and fill land	990	0.1
1016	Udorthents, loamy, cut and fill land	330	*
1027	Udorthents, wet substratum, fill land	410	*
1030	Pits, gravel-Udipsamments complex	1,430	0.2
1104B	Waukon-Dorset complex, 1 to 8 percent slopes	540	*
1104C	Waukon-Dorset complex, 8 to 15 percent slopes	990	0.1
1111	Nidaros muck, frequently flooded	1,110	0.1
1113	Haslie, Seelyeville, and Cathro soils, ponded	6,950	0.8
1125B	Sverdrup-Abbeylake complex, 1 to 6 percent slopes	1,300	0.2
1125C	Sverdrup-Abbeylake complex, 6 to 12 percent slopes	380	*
1126B	Verndale-Nymore complex, 1 to 6 percent slopes	4,190	0.4
1127A	Bootlake-Graycalm complex, 0 to 2 percent slopes	3,830	0.4
1127B	Bootlake-Graycalm complex, 2 to 8 percent slopes	3,980	0.4
1128	Cathro muck, frequently flooded	1,360	0.2
1129	Lindaas silty clay loam, morainic	3,300	0.4
1130	Wolverton fine sandy loam	1,600	0.2
1131B	Verndale-Abbeylake complex, 1 to 6 percent slopes	3,580	0.4
1132B	Eagleview-Balmlake complex, 1 to 8 percent slopes	2,580	0.3
1132C	Eagleview-Balmlake complex, 8 to 15 percent slopes	1,620	0.2
1132E	Eagleview-Balmlake complex, 15 to 30 percent slopes	610	*
1135	Foxlake silty clay loam	2,140	0.2
1136	Nidaros muck	6,430	0.7
1137B	Birchlake silty clay loam, 1 to 6 percent slopes	3,500	0.4

See footnote at end of table.

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
1137C	Birchlake silty clay loam, 6 to 12 percent slopes, eroded	2,750	0.3
1137D	Birchlake silty clay loam, 12 to 20 percent slopes, eroded	1,230	0.1
1137E	Birchlake silty clay loam, 20 to 30 percent slopes	240	*
1138	Rushlake and Hangaard soils, lake beaches	3,460	0.4
1140B	Eagleview-Snellman complex, 1 to 8 percent slopes	2,470	0.3
1140C	Eagleview-Snellman complex, 8 to 15 percent slopes	1,510	0.2
1149	Hamerly clay loam	4,650	0.5
1195B	Sybil-Eagleview complex, 2 to 8 percent slopes	220	*
1195C	Sybil-Eagleview complex, 8 to 15 percent slopes	260	*
1195E	Sybil-Eagleview complex, 15 to 30 percent slopes	110	*
1196B	Lida-Two Inlets complex, 1 to 8 percent slopes	340	*
1196C	Lida-Two Inlets complex, 8 to 15 percent slopes	920	*
1196E	Lida-Two Inlets complex, 15 to 30 percent slopes	550	*
1200	Egglake loam	4,290	0.5
1201C	Sugarbush-Snellman complex, 8 to 15 percent slopes	5,110	0.6
1201E	Sugarbush-Snellman complex, 15 to 35 percent slopes	4,880	0.5
1210	Paddock-Epoufette complex	1,600	0.2
1211	Egglake-Cathro complex	2,890	0.3
1225	Wykeham-Karlstad complex	900	*
1227	Quam, Cathro, and Urness soils, ponded	3,950	0.4
1230	Haslie and Nidaros soils, ponded	10,300	1.1
1234B	Formdale-Buse complex, 2 to 6 percent slopes	16,360	1.8
1235B	Formdale-Buse-Sandberg complex, 2 to 6 percent slopes	970	0.1
1236B	Eagleview loamy sand, 1 to 8 percent slopes	5,970	0.6
1236C	Eagleview loamy sand, 8 to 15 percent slopes	5,040	0.5
1236E	Eagleview loamy sand, 15 to 30 percent slopes	3,420	0.4
1238E	Two Inlets-Sugarbush complex, 15 to 30 percent slopes	12,080	1.3
1242D	Sandberg-Arvilla complex, 12 to 20 percent slopes	3,100	0.3
1243B	Sol sandy loam, 2 to 8 percent slopes, very stony	850	*
1243C	Sol sandy loam, 8 to 15 percent slopes, very stony	3,500	0.4
1243E	Sol sandy loam, 15 to 30 percent slopes, very stony	800	*
1244B	Sol-Sugarbush complex, 2 to 8 percent slopes, very stony	2,300	0.3
1244C	Sol-Sugarbush complex, 8 to 15 percent slopes, very stony	6,600	0.7
1244E	Sol-Sugarbush complex, 15 to 30 percent slopes, very stony	3,000	0.3
1246	Winger silty clay loam	7,720	0.8
1247D	Corliss-Dorset complex, 12 to 20 percent slopes	1,260	0.1
1248C	Nymore-Verndale complex, 6 to 12 percent slopes	1,730	0.2
1249C	Graycalm-Bootlake complex, 8 to 15 percent slopes	2,160	0.2
1250C	Abbeylake-Verndale complex, 6 to 12 percent slopes	3,580	0.4
1251	Lamoure silt loam, channeled, frequently flooded	890	*
1252B	Bootlake-Eagleview complex, 1 to 8 percent slopes	7,390	0.8
1263C	Eagleview-Bootlake complex, 8 to 15 percent slopes	4,020	0.4
1291	Sedgeville loam, frequently flooded	700	*
1306	Karlstad sandy loam	3,680	0.4
1317	Vallers silty clay loam	10,630	1.2
1318	Darnen loam	380	*
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony	6,750	0.7
1319C	Rockwood sandy loam, 6 to 12 percent slopes, stony	1,530	0.2
1319D	Rockwood sandy loam, 12 to 20 percent slopes, stony	160	*
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony	15,130	1.6
1321	Paddock fine sandy loam, stony	7,390	0.8
1365	Hillview fine sandy loam	590	*
1825B	Seelyeville muck, seep land, 1 to 10 percent slopes	2,510	0.3
1878	Hamre muck	1,960	0.2
1938	Lakepark clay loam	4,060	0.4
1942	Forada mucky loam, depressional	1,190	0.1
1967	Hamerly-Vallers complex	14,210	1.5
1975	Oylen sandy loam	2,060	0.2
1997	Vallers-Hamerly-Winger complex	6,160	0.7
	Water	84,600	9.2
	Total	924,300	100.0

* Less than 0.1 percent.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Crops and Pasture

By Lee R. Johnson, district conservationist, and David D. Breitbach, conservation agronomist, Natural Resources Conservation Service.

The main forms of agriculture in Becker County are cash crop farming and dairy farming. Becker County has approximately 295,000 acres of cropland and 80,500 acres of pastureland. In 1990, about 57,000 acres was used for corn, soybeans, and other row crops, such as potatoes, edible dry beans, and sunflowers. Approximately 123,000 acres was used for small grain, including wheat, barley, and oats. Approximately 130,000 acres was used for hay and pasture (USDA, 1990).

The soils in Becker County vary from the dark, fertile glacial till soils that formed under prairie vegetation in the northwestern part of the county to the light colored, sandy soils with very low fertility that formed under forest vegetation on the sandy outwash plains in eastern Becker County. Because of this variation, there are substantial differences in the crops grown in the eastern and western parts of the county. In recent years, irrigation of potatoes, dry edible beans, and corn has increased in eastern Becker County.

Erosion by wind or by water reduces soil productivity by removing nutrients and organic matter from the surface layer. As the thickness of the topsoil is reduced through erosion, part of the less fertile subsoil is incorporated into the plow layer. Erosion can be especially damaging on soils that are underlain by sand or gravel and that have a low water-holding capacity. Examples are Sandberg and Arvilla soils.

Wind erosion and water erosion result in the sedimentation of ditches, streams, and lakes. The sediments carry nutrients and pesticides. Sediments deposited in ditches interfere with drainage systems. Removing these sediments is expensive. Measures that control erosion and minimize the pollution of streams and lakes improve the quality of water for commercial or recreational uses and for fish and wildlife.

Wind erosion is a hazard on approximately 60 percent of the cropland in the county. The factors that influence the susceptibility to wind erosion are the texture of the surface layer, free carbonates at the surface, surface roughness, field size, and vegetative cover.

The most serious erosion occurs in northwestern Becker County where small grain and row crops are grown intensively. A lack of wind barriers makes the area very susceptible to wind erosion. The soils in this area that are most susceptible to wind erosion are Hamerly, Winger, Vallers, and McIntosh soils. These soils typically have a surface layer of clay loam or silty clay loam. In many of the soils, free carbonates at the surface adversely affect the stability of soil aggregates and thus increase the hazard of wind erosion. Management methods have little effect on soil texture or on the content of free calcium carbonates.

The Ponsford Prairie Sand Plain in eastern Becker County also has a high potential for wind erosion. Intensive farming under irrigation has greatly increased the hazard of wind erosion in this area. The present trend towards raising potatoes, dry edible beans, and corn under irrigation increases the wind erosion hazard. Dorset, Verndale, Nymore, Bootlake, and Graycalm soils are examples of soils that are susceptible to wind erosion on the Ponsford Prairie (fig. II-1).

Farmers should consider the factors of surface roughness, field size, and vegetative cover when methods of controlling wind erosion are designed. Surface roughness can be increased by certain types of tillage. Leaving moldboard-plowed fields rough and cloddy in the fall can reduce the hazard of erosion until

Figure II-1.—Dry edible beans in an irrigated area of Verndale-Nymore complex, 1 to 6 percent slopes. Center-pivot irrigation is used extensively on the droughty glacial outwash soils in eastern Becker County to provide a dependable source of water for various crops.

these conditions are destroyed by freezing and thawing. Using a chisel plow instead of a moldboard plow results in a more stable, better defined pattern of ridges and valleys and incorporates crop residue into the soil or leaves it on the surface.

Crop residue management is one of the most cost-effective methods of controlling wind erosion. Tillage practices that leave all or part of the crop residue on the surface are very effective during periods when the soil is highly susceptible to wind erosion. Conservation tillage systems that can be used in Becker County include reduced tillage (using chisel plows, field cultivators, and disks) and no-till systems for planting small grain, legumes, and corn.

The factors that should be considered when a system of conservation tillage is selected include soil texture, drainage, slope, and the crops to be grown. Tillage methods that leave a large amount of crop residue on the surface are most effective in areas of moderately well drained to excessively drained soils.

Water erosion is a concern on approximately 20 percent of the cropland in the county. It is a hazard in the gently sloping to very steep areas of Formdale, Barnes, Langhei, Forman, Birchlake, Waukon, Nebish, and Snellman soils. It is also a hazard in the longer sloping areas of Rockwood and Blowers soils in southeastern Becker County. Contour farming, terraces, diversions, and crop rotations that include grasses and legumes are effective in controlling sheet and rill erosion. In many areas, terraces, contour farming, and diversions are not practical because of the short, irregular slopes. In these areas, conservation tillage systems help to control sheet and rill erosion and grassed waterways combined with sediment-control structures help to control erosion caused by a concentrated flow.

Drainage is a major consideration affecting the management of crops and pasture. Managing drainage

in conformance with regulations influencing wetlands may require special permits and extra planning. Wetness is a problem on about 22 percent of the cropland in the county. Open ditches are commonly used to remove excess water on some soils, such as Flom, Colvin, Quam, and Vallers soils. Surface drainage is used mainly in northwestern Becker County (fig. II-2). The majority of drainage work now consists of cleaning and maintaining existing drainage ditches. Tiling or subsurface drainage is limited because of the lack of adequate outlets and the high cost of installation.

The inherent fertility of the soils varies tremendously from the western part of the county to the eastern part. The variation is the result of differences in parent materials and vegetation. Soils in the western part of Becker County formed under prairie vegetation and tend to be alkaline. Soils in the eastern part formed under forest vegetation and tend to be more acidic in the upper part of the soil profile. The prairie soils typically are low in phosphorus and high in potassium, and the forested soils typically are high in phosphorus and low in potassium and sulfur.

Applications of fertilizer increase crop yields in most areas of Becker County. The amount of fertilizer applied should be based on the results of soil tests. Applications vary greatly, depending on soil type, past management, and nutrient demands of the crop to be grown.

About 80,500 acres in the county is used as permanent pasture. Areas that are too wet, too steep, too rocky, or too droughty for cultivation commonly are used as permanent pasture. Existing pastures can be improved by using a pasture rotation system, applying fertilizer, controlling weeds, and deferring grazing during wet periods or until the grasses reach a proper height. In some areas, pastures can be renovated by reseeding to a more productive species. In fields where erosion is a serious hazard or in areas that are are too rocky to be tilled, no-till drills or other types of interseeding equipment can be used to reestablish hayland and pasture.

Cropland Management Considerations

The management concerns affecting the use of the detailed map units in the survey area for crops are shown in the table "Cropland Management Considerations." The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the rate of water infiltration. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are *channels, flooding, gullies,* and *ponding.*

Additional considerations are as follows:

Lime content, limited available water capacity, potential poor tilth and compaction, and *restricted permeability.*—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use, nutrient management, control of erosion, pest and weed control,* and *timely planting and harvesting.* An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase the salinity of the soil.

Figure II-2.—A shallow drainage ditch in an area of Winger silty clay loam.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word "channeled" is included in the map unit name.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

Gullied.—The word "gullied" is included in the map unit name.

High organic matter content.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity .—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited organic matter content.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map

unit component. The water table is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

Previously eroded.—The word "eroded" is included in the map unit name.

Restricted permeability.—Permeability is less than 0.06 inch per hour within the soil profile.

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word "stony" or "bouldery" is included in the map unit name or in the description of the surface layer.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Water table.—A water table within 2.5 feet of the surface.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table "Land Capability and Yields per Acre of Crops and Pasture." In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, for stand survival, and for erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table "Land Capability and Yields per Acre of Crops and Pasture."

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for

crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e, w, s,* or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table "Land Capability and Yields per Acre of Crops and Pasture" at the end of this section.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 249,410 acres, or nearly 27 percent of the survey area, meets the requirements for prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." This list does not constitute a recommendation for a particular land use. On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps in Part III. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Dean Hendrickson, technician, Becker County Soil and Water Conservation District, helped prepare this section.

When the early settlers arrived in Becker County, approximately 25 percent of the land area was prairie. Windbreaks were essential for protecting farmsteads and livestock in the northwestern part of the county. Many of the older existing windbreaks were established in the 1920's and 1930's. The species planted in these older windbreaks were primarily elm, boxelder, and cottonwood.

The renovation of old, deteriorated farmstead windbreaks is a common conservation practice. Renovation consists of clearing and then replanting to new species. Field windbreaks have been established in northwestern Becker County and on the Ponsford Prairie. The soils in these areas are susceptible to wind erosion. The practice of creating larger fields and eliminating fence rows has necessitated the establishment of more field windbreaks.

Maximum growth, survival rates, and species adaptability vary dramatically in Becker County. The species selected for use in windbreaks should be

compatible with the type of soil, and measures that control competition from weeds are needed.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks and Environmental Plantings" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These soils have a low or

moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

CROPLAND MANAGEMENT CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Cropland management considerations
20B:	
Chapett	Potential for surface-water contamination Water erosion Wind erosion
20C2:	
Chapett	Potential for surface-water contamination Previously eroded Water erosion Wind erosion
20E:	
Chapett	Potential for surface-water contamination Slope Water erosion Wind erosion
26:	
Aazdahl	Potential for ground-water contamination Potential poor tilth and compaction
33B:	
Barnes	Potential for surface-water contamination Water erosion
36:	
Flom	Potential for ground-water contamination Potential poor tilth and compaction Water table
38B:	
Waukon	Potential for surface-water contamination Water erosion
38C:	
Waukon	Potential for surface-water contamination Water erosion
38E:	
Waukon	Potential for surface-water contamination Slope Water erosion
40B:	
Nebish	Limited organic matter content Potential for surface-water contamination Water erosion
40C:	
Nebish	Limited organic matter content Potential for surface-water contamination Water erosion
40E:	
Nebish	Limited organic matter content Potential for surface-water contamination Slope Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
47:	
Colvin	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
63:	
Rockwell	Excessive permeability Lime content Potential for ground-water contamination Water table Wind erosion
108:	
Mcintosh	Lime content Potential for ground-water contamination Water table Wind erosion
111:	
Hangaard	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
121:	
Wykeham	Potential for ground-water contamination Wind erosion
125:	
Beltrami	Potential for ground-water contamination
133A:	
Dalbo	Potential for ground-water contamination
133B:	
Dalbo	Potential for ground-water contamination Potential for surface-water contamination Water erosion
133C:	
Dalbo	Potential for ground-water contamination Potential for surface-water contamination Water erosion
133E:	
Dalbo	Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion
137:	
Dovray	Ponding Potential for ground-water contamination Potential poor tilth and compaction
141B:	
Egeland	Potential for surface-water contamination Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
141C:	
Egeland	Potential for surface-water contamination Water erosion Wind erosion
168B:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
168C2:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
168D2:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
168E:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion
171B:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
180:	
Gonvick	Potential for ground-water contamination
184:	
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
191:	
Epoufette	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
202:	
Meehan	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
207D:	
Nymore	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
267B:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
267C:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
267E:	
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion
315A:	
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
315B:	
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
332B:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
335:	
Urness	High organic matter content Lime content Ponding Potential for ground-water contamination Wind erosion
339:	
Fordville	Excessive permeability Potential for ground-water contamination

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
344:	
Quam	Ponding Potential for ground-water contamination Potential poor tilth and compaction
351:	
Colvin	Lime content Ponding Potential for ground-water contamination Potential poor tilth and compaction Wind erosion
375:	
Forada	Excessive permeability Potential for ground-water contamination Water table
398:	
Winger	Lime content Ponding Potential for ground-water contamination Potential poor tilth and compaction Wind erosion
406A:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
406B:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
413:	
Osakis	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
418:	
Lamoure	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
422B:	
Bygland	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
422C:	
Bygland	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
503B:	
Balmlake	Potential for surface-water contamination Water erosion Wind erosion
503C:	
Balmlake	Potential for surface-water contamination Water erosion Wind erosion
503E:	
Balmlake	Potential for surface-water contamination Slope Water erosion Wind erosion
508:	
Wyndmere	Lime content Potential for ground-water contamination Water table Wind erosion
540:	
Seelyeville	High organic matter content Ponding Potential for ground-water contamination Wind erosion
541:	
Rifle	High organic matter content Ponding Potential for ground-water contamination
544:	
Cathro	High organic matter content Ponding Potential for ground-water contamination Wind erosion
564:	
Friendship	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
567A:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
567B:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
579C2:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
579C2:	
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
624:	
Rosy	Limited organic matter content Potential for ground-water contamination Wind erosion
701:	
Runeberg	Ponding Potential for ground-water contamination
711B:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
711C:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
718B:	
Naytahwaush	Potential for surface-water contamination Water erosion
718C:	
Naytahwaush	Potential for surface-water contamination Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
718E:	
Naytahwaush	Potential for surface-water contamination Slope Water erosion
721E:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
746:	
Haslie	High organic matter content Ponding Potential for ground-water contamination Wind erosion
747B:	
Audubon	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
753D:	
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
753E:	
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
765:	
Smiley	Potential for ground-water contamination Water table
767:	
Auganaush	Potential for ground-water contamination Water table
775B:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
775B:	
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
775C:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
776B:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
776C:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
776E:	
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
776E:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
778B:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
778C:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
780B:	
Audubon	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Boyerlake	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
780C2:	
Audubon	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
Boyerlake	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
780D2:	
Audubon	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
Boyerlake	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
785:	
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
Winger	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
786:	
Winger	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
Colvin	Lime content Ponding Potential for ground-water contamination Potential poor tilth and compaction Wind erosion
797:	
Mooselake	High organic matter content Ponding Potential for ground-water contamination
Lupton	High organic matter content Potential for ground-water contamination Water table Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
867B:	
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Menahga	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
867C:	
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Menahga	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
867E:	
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Menahga	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
903B:	
Barnes	Potential for surface-water contamination Water erosion
Langhei	Lime content Potential for surface-water contamination Water erosion Wind erosion
903C2:	
Barnes	Potential for surface-water contamination Previously eroded Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
903C2:	
Langhei	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
931C2:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Wind erosion
942D2:	
Langhei	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
Barnes	Potential for surface-water contamination Previously eroded Slope Water erosion
943D2:	
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion Wind erosion
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
943E:	
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion Wind erosion
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
951B:	
Nebish	Limited organic matter content Potential for surface-water contamination Water erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
951C:	
Nebish	Limited organic matter content Potential for surface-water contamination Water erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
951E:	
Nebish	Limited organic matter content Potential for surface-water contamination Slope Water erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1015:	
Udipsamments	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1016:	
Udorthents	Limited available water capacity Slope Water erosion Wind erosion
1027:	
Udorthents	Potential for ground-water contamination
1030:	
Pits	Nonsoil material

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1030:	
Udipsamments	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Wind erosion
1104B:	
Waukon	Potential for surface-water contamination Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1104C:	
Waukon	Potential for surface-water contamination Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1111:	
Nidaros	Excessive permeability Flooding High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1113:	
Haslie	High organic matter content Ponding Potential for ground-water contamination
Seelyeville	High organic matter content Ponding Potential for ground-water contamination
Cathro	High organic matter content Ponding Potential for ground-water contamination
1125B:	
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1125C:	
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1126B:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Nymore	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1127A:	
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
1127B:	
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1128:	
Cathro	Flooding High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1129:	
Lindaas	Potential for ground-water contamination Potential poor tilth and compaction Water table
1130:	
Wolverton	Lime content Potential for ground-water contamination Wind erosion
1131B:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1132B:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Balmlake	Potential for surface-water contamination Water erosion Wind erosion
1132C:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Balmlake	Potential for surface-water contamination Water erosion Wind erosion
1132E:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Balmlake	Potential for surface-water contamination Slope Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1135:	
Foxlake	Potential for ground-water contamination Potential poor tilth and compaction Water table
1136:	
Nidaros	Excessive permeability High organic matter content Ponding Potential for ground-water contamination Wind erosion
1137B:	
Birchlake	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
1137C:	
Birchlake	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
1137D:	
Birchlake	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
1137E:	
Birchlake	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion
1138:	
Rushlake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
Hangaard	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1140B:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Snellman	Potential for surface-water contamination Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1140C:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Snellman	Potential for surface-water contamination Water erosion Wind erosion
1149:	
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
1195B:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1195C:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1195E:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1195E:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1196B:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1196C:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1196E:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Slope Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1200:	
Egglake	Potential for ground-water contamination Water table

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1201C:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Snellman	Potential for surface-water contamination Water erosion Wind erosion
1201E:	
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion
1210:	
Paddock	Dense layer Limited available water capacity Potential for ground-water contamination Restricted permeability Water table Wind erosion
Epoufette	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1211:	
Egglake	Potential for ground-water contamination Water table Wind erosion
Cathro	High organic matter content Ponding Potential for ground-water contamination Wind erosion
1225:	
Wykeham	Potential for ground-water contamination Wind erosion
Karlstad	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1227:	
Quam	Ponding Potential for ground-water contamination
Cathro	High organic matter content Ponding Potential for ground-water contamination
Urness	High organic matter content Lime content Ponding Potential for ground-water contamination Wind erosion
1230:	
Haslie	High organic matter content Ponding Potential for ground-water contamination
Nidaros	Excessive permeability High organic matter content Ponding Potential for ground-water contamination
1234B:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Buse	Lime content Potential for surface-water contamination Potential poor tilth and compaction Water erosion Wind erosion
1235B:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Buse	Lime content Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
1236B:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1236C:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1236E:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1238E:	
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1242D:	
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1243B:	
Sol	Potential for surface-water contamination Surface stones Water erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1243C:	
Sol	Potential for surface-water contamination Surface stones Water erosion
1243E:	
Sol	Potential for surface-water contamination Slope Surface stones Water erosion
1244B:	
Sol	Potential for surface-water contamination Surface stones Water erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Surface stones Water erosion Wind erosion
1244C:	
Sol	Potential for surface-water contamination Surface stones Water erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Surface stones Water erosion Wind erosion
1244E:	
Sol	Potential for surface-water contamination Slope Surface stones Water erosion
Sugarbush	Excessive permeability Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Surface stones Water erosion Wind erosion
1246:	
Winger	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1247D:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1248C:	
Nymore	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Verndale	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1249C:	
Graycalm	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1250C:	
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1251:	
Lamoure	Channeled Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1252B:	
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1263C:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Bootlake	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1291:	
Sedgeville	Excessive permeability Flooding Ponding Potential for ground-water contamination Potential for surface-water contamination
1306:	
Karlstad	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1317:	
Vallers	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1318:	
Darnen	No major limitations or hazards
1319B:	
Rockwood	Dense layer Limited available water capacity Potential for surface-water contamination Restricted permeability Surface stones Water erosion Wind erosion
1319C:	
Rockwood	Dense layer Limited available water capacity Potential for surface-water contamination Restricted permeability Surface stones Water erosion Wind erosion
1319D:	
Rockwood	Dense layer Limited available water capacity Potential for surface-water contamination Restricted permeability Slope Surface stones Water erosion Wind erosion
1320B:	
Blowers	Dense layer Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Surface stones Water erosion Water table Wind erosion
1321:	
Paddock	Dense layer Potential for ground-water contamination Restricted permeability Surface stones Water table Wind erosion
1365:	
Hillview	Potential for ground-water contamination Water table Wind erosion
1825B:	
Seelyeville	High organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

CROPLAND MANAGEMENT CONSIDERATIONS--Continued

Map symbol and soil name	Cropland management considerations
1878:	
Hamre	High organic matter content Ponding Potential for ground-water contamination Wind erosion
1938:	
Lakepark	Potential for ground-water contamination Potential poor tilth and compaction Water table
1942:	
Forada	Excessive permeability Limited available water capacity Ponding Potential for ground-water contamination
1967:	
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
Vallers	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
1975:	
Oylen	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1997:	
Vallers	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion
Winger	Lime content Ponding Potential for ground-water contamination Potential poor tilth and compaction Wind erosion

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
20B---------- Chapett	2e	4.7	57.0	85.0	3.2	28.0	1550.0	38.0
20C2---------- Chapett	3e	3.9	50.0	70.0	2.6	23.0	1270.0	30.0
20E---------- Chapett	6e	3.1	---	---	2.1	---	---	---
26---------- Aazdahl	1	6.0	90.0	110.0	4.1	40.0	2000.0	54.0
33B---------- Barnes	2e	5.7	86.0	104.0	3.9	37.0	1890.0	51.0
36---------- Flom	2w	5.2	75.0	95.0	3.6	30.0	1730.0	45.0
38B---------- Waukon	2e	5.2	80.0	95.0	3.6	33.0	1730.0	48.0
38C---------- Waukon	3e	4.4	72.0	80.0	3.0	28.0	1460.0	43.0
38E---------- Waukon	6e	3.6	---	---	2.4	---	---	---
40B---------- Nebish	2e	5.0	77.0	90.0	3.4	31.0	1640.0	46.0
40C---------- Nebish	3e	4.1	69.0	75.0	2.8	26.0	1370.0	41.0
40E---------- Nebish	6e	3.4	---	---	2.3	---	---	---
47---------- Colvin	2w	5.1	71.0	92.0	3.5	27.0	1670.0	42.0
63---------- Rockwell	2w	5.0	69.0	90.0	3.4	26.0	1640.0	41.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
108---------- McIntosh	2s	5.9	86.0	107.0	4.0	37.0	1950.0	51.0
111---------- Hangaard	4w	3.1	50.0	57.0	2.1	26.0	1040.0	32.0
121---------- Wykeham	1	4.4	53.0	80.0	3.0	25.0	1460.0	31.0
125---------- Beltrami	2e	5.2	80.0	95.0	3.6	33.0	1730.0	48.0
133A---------- Dalbo	1	5.0	77.0	91.0	3.4	31.0	1660.0	46.0
133B---------- Dalbo	2e	5.0	77.0	91.0	3.4	31.0	1660.0	46.0
133C---------- Dalbo	3e	4.2	69.0	76.0	2.9	26.0	1380.0	41.0
133E---------- Dalbo	6e	3.4	---	---	2.3	---	---	---
137---------- Dovray	3w	3.9	50.0	71.0	2.7	18.0	1290.0	30.0
141B---------- Egeland	3e	5.0	71.0	90.0	3.4	28.0	1640.0	42.0
141C---------- Egeland	6e	4.1	60.0	75.0	2.8	23.0	1370.0	36.0
168B---------- Forman	2e	5.8	87.0	105.0	3.9	38.0	1910.0	52.0
168C2---------- Forman	3e	5.4	78.0	99.0	3.7	32.0	1800.0	47.0
168D2---------- Forman	4e	4.6	63.0	84.0	3.2	22.0	1530.0	38.0
168E---------- Forman	6e	3.7	---	---	2.5	---	---	---
171B---------- Formdale	2e	5.8	87.0	105.0	3.9	38.0	1910.0	52.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
180---------- Gonvick	1	5.5	83.0	100.0	3.8	35.0	1820.0	49.0
184---------- Hamerly	2s	5.9	86.0	107.0	4.0	37.0	1950.0	51.0
191---------- Epoufette	4w	3.4	52.0	61.0	2.3	28.0	1110.0	34.0
202---------- Meehan	4w	2.9	47.0	53.0	2.0	24.0	960.0	31.0
207D---------- Nymore	6s	1.8	20.0	32.0	1.2	13.0	580.0	12.0
267B---------- Snellman	2e	4.1	50.0	75.0	2.8	23.0	1370.0	30.0
267C---------- Snellman	3e	3.3	42.0	60.0	2.3	18.0	1090.0	25.0
267E---------- Snellman	6e	2.5	---	---	1.7	---	---	---
315A---------- Bootlake	3s	2.9	38.0	53.0	2.0	19.0	960.0	22.0
315B---------- Bootlake	3s	2.9	38.0	53.0	2.0	19.0	960.0	22.0
332B---------- Sugarbush	3s	2.7	33.0	49.0	1.8	17.0	890.0	20.0
335---------- Urness	3w	1.9	30.0	35.0	1.3	13.0	640.0	18.0
339---------- Fordville	2s	4.1	68.0	75.0	2.8	35.0	1370.0	40.0
344---------- Quam	3w	3.0	53.0	75.0	2.8	20.0	1370.0	31.0
351---------- Colvin	3w	3.0	53.0	75.0	2.8	20.0	1370.0	31.0
375---------- Forada	2w	3.6	55.0	65.0	2.4	30.0	1180.0	36.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
398---------- Winger	3w	3.0	53.0	75.0	2.8	20.0	1370.0	31.0
406A---------- Dorset	3s	2.9	36.0	53.0	2.0	19.0	960.0	22.0
406B---------- Dorset	3s	2.9	39.0	53.0	2.0	19.0	960.0	22.0
413---------- Osakis	3s	3.2	50.0	58.0	2.2	24.0	1060.0	26.0
418---------- Lamoure	2w	3.9	60.0	70.0	2.6	26.0	1270.0	36.0
422B---------- Bygland	2e	5.5	86.0	100.0	3.8	35.0	1820.0	51.0
422C---------- Bygland	3e	5.2	75.0	95.0	3.6	30.0	1730.0	45.0
503B---------- Balmlake	2e	4.1	50.0	75.0	2.8	23.0	1370.0	30.0
503C---------- Balmlake	3e	3.3	42.0	60.0	2.3	18.0	1090.0	25.0
503E---------- Balmlake	6e	2.5	---	---	1.7	---	---	---
508---------- Wyndmere	2s	5.2	85.0	95.0	3.6	33.0	1730.0	47.0
540---------- Seelyeville	6w	---	---	---	---	---	---	---
541---------- Rifle	6w	---	---	---	---	---	---	---
544---------- Cathro	6w	---	---	---	---	---	---	---
564---------- Friendship	4s	2.6	36.0	48.0	1.8	19.0	870.0	22.0
567A---------- Verndale	3s	3.1	41.0	57.0	2.1	21.0	1040.0	23.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
567B---------- Verndale	3s	3.1	41.0	57.0	2.1	21.0	1040.0	23.0
579C2----------		4.2	69.0	76.0	2.9	27.0	1390.0	39.0
Formdale--------	3e							
Langhei---------	4e							
Sandberg--------	6s							
624---------- Rosy	1	4.4	53.0	80.0	3.0	25.0	1460.0	31.0
701---------- Runeberg	6w	---	---	---	---	---	---	---
711B---------- Arvilla-Sandberg	4s	2.8	35.0	52.0	1.9	18.0	940.0	21.0
711C----------		2.3	31.0	41.0	1.6	15.0	750.0	18.0
Arvilla---------	4e							
Sandberg--------	6s							
718B---------- Naytahwaush	2e	5.0	77.0	91.0	3.4	31.0	1660.0	46.0
718C---------- Naytahwaush	3e	4.2	69.0	76.0	2.9	26.0	1380.0	41.0
718E---------- Naytahwaush	6e	3.4	---	---	2.3	---	---	---
721E---------- Corliss	7e	1.0	---	---	0.7	---	---	---
746---------- Haslie	6w	---	---	---	---	---	---	---
747B---------- Audubon	2e	5.6	84.0	101.0	3.8	36.0	1840.0	50.0
753D---------- Abbeylake	6e	1.6	20.0	32.0	1.2	13.0	580.0	13.0
753E---------- Abbeylake	7e	1.4	---	---	0.9	---	---	---

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
765---------- Smiley	2w	5.2	75.0	95.0	3.6	30.0	1730.0	45.0
767---------- Auganaush	2w	4.5	65.0	81.0	3.0	23.0	1470.0	39.0
775B----------		2.5	32.0	46.0	1.7	16.0	830.0	18.0
Sugarbush-------	3s							
Two Inlets------	4s							
775C----------		1.9	28.0	35.0	1.4	14.0	640.0	15.0
Sugarbush-------	4e							
Two Inlets------	4s							
776B----------		3.6	44.0	66.0	2.5	21.0	1200.0	26.0
Snellman--------	2e							
Sugarbush-------	3s							
776C----------		2.9	38.0	53.0	2.0	17.0	960.0	21.0
Snellman--------	3e							
Sugarbush-------	4e							
776E---------- Snellman- Sugarbush	6e	2.1	---	---	1.4	---	---	---
778B----------		2.7	22.0	50.0	1.9	33.0	900.0	21.0
Dorset----------	3s							
Corliss---------	4s							
778C----------		2.1	20.0	38.0	1.4	24.0	690.0	17.0
Dorset----------	4e							
Corliss---------	4s							
780B---------- Audubon- Boyerlake	2e	5.6	84.0	101.0	3.8	36.0	1830.0	52.0
780C2---------- Audubon- Boyerlake	3e	4.8	75.0	87.0	3.3	31.0	1580.0	46.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
780D2---------- Audubon-Boyerlake	4e	4.2	52.0	76.0	2.8	26.0	1380.0	36.0
785----------		5.6	81.0	102.0	3.8	34.0	1850.0	51.0
Hamerly---------	2s							
Winger----------	2w							
786----------		4.8	72.0	92.0	3.5	28.0	1680.0	47.0
Winger----------	2w							
Hamerly---------	2s							
Colvin----------	3w							
797----------		---	---	---	---	---	---	---
Mooselake-------	6w							
Lupton----------	7w							
867B---------- Graycalm-Menahga	4s	2.5	29.0	44.0	1.7	14.0	810.0	18.0
867C----------		1.9	25.0	34.0	1.3	11.0	630.0	16.0
Graycalm--------	6s							
Menahga---------	4s							
867E----------		1.3	---	---	0.9	---	---	---
Graycalm--------	6s							
Menahga---------	7s							
903B----------		5.6	84.0	101.0	3.8	36.0	1830.0	51.0
Barnes----------	2e							
Langhei---------	3e							
903C2----------		4.9	76.0	88.0	3.3	31.0	1610.0	46.0
Barnes----------	3e							
Langhei---------	4e							

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
931C2----------		4.9	82.0	89.0	3.4	32.0	1620.0	48.0
Formdale--------	3e							
Langhei---------	4e							
942D2----------		4.2	52.0	76.0	2.8	27.0	1370.0	35.0
Langhei---------	6e							
Barnes----------	4e							
943D2----------		4.3	53.0	77.0	2.9	27.0	1400.0	37.0
Langhei---------	6e							
Formdale--------	4e							
943E----------		3.2	---	---	2.1	---	---	---
Langhei---------	7e							
Formdale--------	6e							
951B----------		4.4	65.0	80.0	3.0	28.0	1450.0	40.0
Nebish----------	2e							
Sugarbush-------	3s							
951C----------		3.4	55.0	62.0	2.3	22.0	1140.0	35.0
Nebish----------	3e							
Sugarbush-------	4e							
951E----------	6e	2.7	---	---	1.8	---	---	---
Nebish-Sugarbush								
1015----------	8s	---	---	---	---	---	---	---
Udipsamments								
1016----------	6s	---	---	---	---	---	---	---
Udorthents								
1027.								
Udorthents								
1030:								
Pits.								
Udipsamments----	8s	---	---	---	---	---	---	---

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1104B----------		4.3	62.0	78.0	3.0	27.0	1420.0	39.0
Waukon----------	2e							
Dorset----------	3s							
1104C----------		3.6	56.0	65.0	2.4	23.0	1190.0	35.0
Waukon----------	3e							
Dorset----------	4e							
1111---------- Nidaros	6w	---	---	---	---	---	---	---
1113---------- Haslie-Seelyeville-Cathro	8w	---	---	---	---	---	---	---
1125B----------		3.0	38.0	55.0	2.0	20.0	1000.0	22.0
Sverdrup--------	3e							
Abbeylake-------	4s							
1125C----------		2.4	32.0	43.0	1.7	16.0	790.0	22.0
Sverdrup--------	4e							
Abbeylake-------	4s							
1126B----------		2.9	36.0	53.0	2.0	19.0	970.0	20.0
Verndale--------	3s							
Nymore----------	4s							
1127A----------		2.7	33.0	49.0	1.9	17.0	900.0	19.0
Bootlake--------	3s							
Graycalm--------	4s							
1127B----------		2.7	33.0	49.0	1.9	17.0	900.0	19.0
Bootlake--------	3s							
Graycalm--------	4s							
1128---------- Cathro	6w	---	---	---	---	---	---	---

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1129---------- Lindaas	2w	5.0	72.0	91.0	3.4	28.0	1660.0	43.0
1130---------- Wolverton	2s	5.5	83.0	100.0	3.8	35.0	1820.0	49.0
1131B----------		2.9	37.0	54.0	2.0	20.0	1010.0	21.0
Verndale--------	3s							
Abbeylake-------	4s							
1132B----------		3.2	39.0	59.0	2.2	19.0	1100.0	22.0
Eagleview-------	4s							
Balmlake--------	2e							
1132C----------		2.5	33.0	46.0	1.8	15.0	840.0	19.0
Eagleview-------	4s							
Balmlake--------	3e							
1132E----------		1.8	---	---	1.3	---	---	---
Eagleview-------	6s							
Balmlake--------	6e							
1135---------- Foxlake	2w	5.0	72.0	91.0	3.4	28.0	1660.0	43.0
1136---------- Nidaros	6w	---	---	---	---	---	---	---
1137B---------- Birchlake	2e	5.5	86.0	100.0	3.8	35.0	1820.0	51.0
1137C---------- Birchlake	3e	5.2	75.0	95.0	3.6	30.0	1730.0	45.0
1137D---------- Birchlake	4e	4.4	60.0	80.0	3.0	20.0	1460.0	36.0
1137E---------- Birchlake	6e	3.3	---	---	2.2	---	---	---

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1138----------		3.0	48.0	54.0	2.0	25.0	980.0	27.0
Rushlake--------	4s							
Hangaard--------	4w							
1140B----------		3.2	39.0	59.0	2.2	19.0	1070.0	22.0
Eagleview-------	4s							
Snellman--------	2e							
1140C----------		2.5	33.0	46.0	1.8	15.0	840.0	19.0
Eagleview-------	4s							
Snellman--------	3e							
1149---------- Hamerly	2s	5.9	86.0	107.0	4.0	37.0	1950.0	51.0
1195B----------		2.8	34.0	50.0	1.9	18.0	910.0	19.0
Sybil----------	3s							
Eagleview-------	4s							
1195C----------		2.2	30.0	40.0	1.5	15.0	730.0	16.0
Sybil----------	4e							
Eagleview-------	4s							
1195E----------		1.4	---	---	1.0	---	---	---
Sybil----------	6e							
Eagleview-------	6s							
1196B----------		2.6	32.0	47.0	1.7	16.0	850.0	18.0
Lida----------	3s							
Two Inlets------	4s							
1196C----------		2.0	28.0	36.0	1.4	14.0	660.0	14.0
Lida----------	4e							
Two Inlets------	4s							
1196E----------		1.3	---	---	0.9	---	---	---
Lida----------	6e							
Two Inlets------	6s							

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1200---------- Egglake	2w	3.6	41.0	65.0	2.4	20.0	1180.0	24.0
1201C---------- Sugarbush--------	4e	2.5	33.0	45.0	1.7	16.0	820.0	18.0
Snellman---------	3e							
1201E---------- Sugarbush-Snellman	6e	1.8	---	---	1.2	---	---	---
1210---------- Paddock----------	2w	3.5	45.0	63.0	2.4	23.0	1140.0	24.0
Epoufette--------	3w							
1211---------- Egglake----------	2w	2.5	29.0	46.0	1.7	14.0	830.0	17.0
Cathro----------	6w							
1225---------- Wykeham----------	1	4.0	49.0	72.0	2.7	24.0	1310.0	30.0
Karlstad---------	3s							
1227---------- Quam-Cathro-Urness	8w	---	---	---	---	---	---	---
1230---------- Haslie-Nidaros	8w	---	---	---	---	---	---	---
1234B---------- Formdale-Buse	2e	5.8	86.0	104.0	3.9	37.0	1890.0	52.0
1235B---------- Formdale---------	2e	5.0	73.0	90.0	3.4	32.0	1640.0	43.0
Buse----------	2e							
Sandberg---------	4s							
1236B---------- Eagleview	4s	2.5	30.0	45.0	1.7	15.0	820.0	18.0

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1236C---------- Eagleview	4s	1.9	26.0	35.0	1.3	12.0	640.0	15.0
1236E---------- Eagleview	6s	1.3	---	---	0.9	---	---	---
1238E----------		1.2	---	---	0.8	---	---	---
Two Inlets------	6s							
Sugarbush-------	6e							
1242D---------- Sandberg-Arvilla	6e	1.7	25.0	30.0	1.1	11.0	550.0	10.0
1243B---------- Sol	6s	4.1	50.0	75.0	2.8	23.0	1370.0	30.0
1243C---------- Sol	6s	3.3	42.0	60.0	2.3	18.0	1090.0	25.0
1243E---------- Sol	7s	2.5	---	---	1.7	---	---	---
1244B---------- Sol-Sugarbush	6s	3.7	45.0	67.0	2.5	21.0	1230.0	23.0
1244C---------- Sol-Sugarbush	6s	2.9	38.0	53.0	2.0	17.0	960.0	21.0
1244E----------		2.1	---	---	1.4	---	---	---
Sol----------	7s							
Sugarbush-------	6s							
1246---------- Winger	2w	5.1	72.0	92.0	3.5	27.0	1670.0	42.0
1247D---------- Corliss-Dorset	6e	1.4	23.0	25.0	0.9	10.0	450.0	10.0
1248C----------		2.3	31.0	42.0	1.6	15.0	760.0	14.0
Nymore----------	6s							
Verndale--------	4e							

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1249C----------		2.1	28.0	38.0	1.4	13.0	690.0	14.0
Graycalm--------	6s							
Bootlake--------	4e							
1250C----------		2.3	31.0	42.0	1.6	15.0	760.0	14.0
Abbeylake-------	4s							
Verndale--------	4e							
1251----------	6w	---	---	---	---	---	---	---
Lamoure								
1252B----------		2.7	33.0	49.0	1.9	17.0	900.0	18.0
Bootlake--------	3s							
Eagleview-------	4s							
1263C----------		2.2	30.0	40.0	1.5	15.0	740.0	18.0
Eagleview-------	4s							
Bootlake--------	4e							
1291----------	6w	---	---	---	---	---	---	---
Sedgeville								
1306----------	3s	3.1	42.0	56.0	2.1	23.0	1020.0	25.0
Karlstad								
1317----------	2w	5.1	72.0	92.0	3.5	27.0	1670.0	42.0
Vallers								
1318----------	1	5.8	83.0	105.0	3.9	35.0	1910.0	49.0
Darnen								
1319B----------	2e	4.1	48.0	74.0	2.8	22.0	1350.0	29.0
Rockwood								
1319C----------	3e	3.3	42.0	60.0	2.3	18.0	1090.0	25.0
Rockwood								
1319D----------	4e	2.5	27.0	45.0	1.7	10.0	820.0	16.0
Rockwood								
1320B----------	2e	4.3	51.0	79.0	3.0	24.0	1440.0	31.0
Blowers								

See footnote at end of table.

LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Barley	Corn	Kentucky bluegrass	Soybeans	Sunflowers	Spring wheat
		Tons	Bu	Bu	AUM*	Bu	Lbs	Bu
1321---------- Paddock	2w	3.5	39.0	64.0	2.4	19.0	1160.0	23.0
1365---------- Hillview	2w	3.6	41.0	65.0	2.4	20.0	1180.0	24.0
1825B---------- Seelyeville	7w	---	---	---	---	---	---	---
1878---------- Hamre	3w	3.0	50.0	70.0	2.6	17.0	1270.0	30.0
1938---------- Lakepark	2w	5.2	75.0	95.0	3.6	30.0	1730.0	45.0
1942---------- Forada	6w	---	---	---	---	---	---	---
1967----------		5.9	86.0	107.0	4.0	37.0	1950.0	52.0
Hamerly---------	2s							
Vallers---------	2w							
1975---------- Oylen	3s	3.3	50.0	60.0	2.3	25.0	1090.0	27.0
1997----------		4.9	72.0	93.0	3.5	29.0	1690.0	45.0
Vallers---------	2w							
Hamerly---------	2s							
Winger----------	3w							

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

PRIME FARMLAND

Map symbol	Soil name
20B	Chapett fine sandy loam, 2 to 8 percent slopes
26	Aazdahl clay loam
33B	Barnes loam, 2 to 6 percent slopes
36	Flom silty clay loam (where drained)
38B	Waukon loam, 2 to 8 percent slopes
40B	Nebish loam, 2 to 8 percent slopes
47	Colvin silty clay loam (where drained)
63	Rockwell loam (where drained)
108	McIntosh silt loam
121	Wykeham fine sandy loam
125	Beltrami loam
133A	Dalbo silt loam, 0 to 2 percent slopes
133B	Dalbo silt loam, 2 to 8 percent slopes
141B	Egeland fine sandy loam, 1 to 6 percent slopes
168B	Forman clay loam, 2 to 6 percent slopes
171B	Formdale clay loam, 2 to 5 percent slopes
180	Gonvick loam
184	Hamerly loam
267B	Snellman sandy loam, 2 to 8 percent slopes
339	Fordville loam
375	Forada loam (where drained)
418	Lamoure silty clay loam, occasionally flooded (where drained)
422B	Bygland silty clay loam, 1 to 6 percent slopes
503B	Balmlake fine sandy loam, 1 to 8 percent slopes
508	Wyndmere fine sandy loam
624	Rosy sandy loam
718B	Naytahwaush loam, 2 to 8 percent slopes
747B	Audubon silty clay loam, 0 to 6 percent slopes
765	Smiley loam (where drained)
767	Auganaush loam (where drained)
780B	Audubon-Boyerlake complex, 1 to 6 percent slopes
785	Hamerly-Winger complex (where drained)
786	Winger-Hamerly-Colvin complex (where drained)
903B	Barnes-Langhei complex, 2 to 6 percent slopes
1129	Lindaas silty clay loam, morainic (where drained)
1130	Wolverton fine sandy loam
1135	Foxlake silty clay loam (where drained)
1137B	Birchlake silty clay loam, 1 to 6 percent slopes
1149	Hamerly clay loam
1200	Egglake loam (where drained)
1234B	Formdale-Buse complex, 2 to 6 percent slopes
1246	Winger silty clay loam (where drained)
1317	Vallers silty clay loam (where drained)
1318	Darnen loam
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony
1321	Paddock fine sandy loam, stony (where drained)
1365	Hillview fine sandy loam (where drained)
1938	Lakepark clay loam (where drained)
1967	Hamerly-Vallers complex (where drained)
1997	Vallers-Hamerly-Winger complex (where drained)

WINDBREAKS AND ENVIRONMENTAL PLANTINGS

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
20B:					
Chapett	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
20C2:					
Chapett	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
20E:					
Chapett	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
26:					
Aazdahl	Nanking cherry	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
33B:					
Barnes	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
36:					
Flom	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
38B:					
Waukon	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
38C:					
Waukon	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
38E:					
Waukon	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
40B:					
Nebish----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
40C:					
Nebish----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
40E:					
Nebish----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
47:					
Colvin----------	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
63:					
Rockwell--------	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
108:					
McIntosh--------	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
111:					
Hangaard--------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
121:					
Wykeham----------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
125:					
Beltrami	Nanking cherry	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
133A:					
Dalbo	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
133B:					
Dalbo	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
133C:					
Dalbo	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
133E:					
Dalbo	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
137:					
Dovray	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
141B:					
Egeland	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
141C:					
Egeland	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
168B:					
Forman	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
168C2:					
Forman----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
168D2:					
Forman----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
168E:					
Forman----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
171B:					
Formdale--------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
180:					
Gonvick---------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
184:					
Hamerly---------	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
191:					
Epoufette-------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
202:					
Meehan----------	---	Redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Silver maple, Carolina poplar, Siouxland cottonwood.
207D:					
Nymore----------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
267B:					
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
267C:					
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
267E:					
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
315A:					
Bootlake	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
315B:					
Bootlake	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
332B:					
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
335:					
Urness	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow	Carolina poplar.
339:					
Fordville	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
344:					
Quam	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
351:					
Colvin----------	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
375:					
Forada----------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
398:					
Winger----------	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
406A:					
Dorset----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
406B:					
Dorset----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
413:					
Osakis----------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
418:					
Lamoure---------	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
422B:					
Bygland---------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
422C:					
Bygland---------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
503B:					
Balmlake--------	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
503C:					
Balmlake--------	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
503E:					
Balmlake--------	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
508:					
Wyndmere--------	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
540:					
Seelyeville-----	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
541:					
Rifle----------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
544:					
Cathro----------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
564:					
Friendship------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
567A:					
Verndale--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
567B:					
Verndale	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
579C2:					
Formdale	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
Langhei	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
Sandberg	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
624:					
Rosy	Nanking cherry	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
701:					
Runeberg	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
711B:					
Arvilla	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Sandberg	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
711C:					
Arvilla	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Sandberg	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
718B:					
Naytahwaush-----	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
718C:					
Naytahwaush-----	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
718E:					
Naytahwaush-----	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
721E:					
Corliss---------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
746:					
Haslie----------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
747B:					
Audubon---------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
753D:					
Abbeylake-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
753E:					
Abbeylake-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
765:					
Smiley----------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
767:					
Auganaush-------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
775B:					
Sugarbush-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Two Inlets------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
775C:					
Sugarbush-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Two Inlets------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
776B:					
Snellman--------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
776C:					
Snellman--------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
776E:					
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
778B:					
Dorset	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Corliss	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
778C:					
Dorset	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Corliss	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
780B:					
Audubon	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
Boyerlake	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
780C2:					
Audubon	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
780C2:					
Boyerlake	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
780D2:					
Audubon	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
Boyerlake	American plum	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
785:					
Hamerly	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
Winger	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
786:					
Winger	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
Hamerly	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
Colvin	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
797:					
Mooselake	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow	Carolina poplar.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
797:					
Lupton----------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
867B:					
Graycalm--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Menahga---------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
867C:					
Graycalm--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Menahga---------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
867E:					
Graycalm--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Menahga---------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
903B:					
Barnes----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
903C2:					
Barnes----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
903C2:					
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
931C2:					
Formdale--------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
942D2:					
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
Barnes----------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
943D2:					
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
Formdale--------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
943E:					
Langhei---------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
943E:					
Formdale	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
951B:					
Nebish	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
951C:					
Nebish	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
951E:					
Nebish	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1104B:					
Waukon	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Dorset	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1104C:					
Waukon	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Dorset	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1125B:					
Sverdrup	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Abbeylake	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1125C:					
Sverdrup	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Abbeylake	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1126B:					
Verndale	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Nymore	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1127A:					
Bootlake	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1127A:					
Graycalm	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1127B:					
Bootlake	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Graycalm	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1129:					
Lindaas	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1130:					
Wolverton	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
1131B:					
Verndale	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Abbeylake	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1132B:					
Eagleview	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Balmlake	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1132C:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Balmlake--------	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
1132E:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Balmlake--------	---	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
1135:					
Foxlake---------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1136:					
Nidaros---------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
1137B:					
Birchlake-------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1137C:					
Birchlake-------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1137D:					
Birchlake-------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1137E:					
Birchlake-------	American plum-----	Amur maple, Siberian peashrub, late lilac.	Sugar maple, hackberry, Russian-olive, white spruce, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1138:					
Rushlake--------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
Hangaard--------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1140B:					
Eagleview-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Snellman--------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1140C:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Snellman--------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1149:					
Hamerly---------	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
1195B:					
Sybil----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1195B:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1195C:					
Sybil----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1195E:					
Sybil----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1196B:					
Lida----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Two Inlets------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1196C:					
Lida----------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Two Inlets------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1196E:					
Lida	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Two Inlets	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1200:					
Egglake	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1201C:					
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1201E:					
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Snellman	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1210:					
Paddock	---	Redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Silver maple, Carolina poplar, Siouxland cottonwood.
Epoufette	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1211:					
Egglake---------	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
Cathro----------	---	Redosier dogwood, Tatarian honeysuckle.	Black ash, tamarack, black spruce.	Golden willow-----	Carolina poplar.
1225:					
Wykeham---------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
Karlstad--------	Nanking cherry----	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1234B:					
Formdale--------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
Buse----------	Tatarian honeysuckle.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash---------	---	---
1235B:					
Formdale--------	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
Buse----------	Tatarian honeysuckle, American plum, late lilac.	Siberian peashrub, hackberry, Russian-olive, eastern redcedar, Black Hills spruce, blue spruce.	Green ash, bur oak	Eastern cottonwood	---
Sandberg--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1236B:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1236C:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1236E:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1238E:					
Two Inlets------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Sugarbush-------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
1242D:					
Sandberg--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Arvilla---------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
1243B:					
Sol----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1243C:					
Sol----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1243E:					
Sol----------	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1244B:					
Sol	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1244C:					
Sol	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1244E:					
Sol	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
Sugarbush	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1246:					
Winger	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
1247D:					
Corliss	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Dorset	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1248C:					
Nymore----------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Verndale--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
1249C:					
Graycalm--------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Bootlake--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
1250C:					
Abbeylake-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Verndale--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
1252B:					
Bootlake--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
1263C:					
Eagleview-------	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, late lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Eastern cottonwood	---
Bootlake--------	Tatarian honeysuckle, late lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash---------	Eastern cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1306:					
Karlstad	Nanking cherry	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1317:					
Vallers	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
1318:					
Darnen	---	Siberian peashrub, redosier dogwood, American plum, late lilac.	Hackberry, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash.	Carolina poplar, Siouxland cottonwood.
1319B:					
Rockwood	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1319C:					
Rockwood	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1319D:					
Rockwood	---	Amur maple, Siberian peashrub, redosier dogwood, late lilac.	Sugar maple, Russian-olive, Black Hills spruce, blue spruce.	Silver maple, green ash, red pine.	Carolina poplar.
1320B:					
Blowers	Nanking cherry	Siberian peashrub, redosier dogwood, blue spruce, late lilac.	Hackberry, Russian-olive, Black Hills spruce.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1321:					
Paddock	---	Redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Silver maple, Carolina poplar, Siouxland cottonwood.
1365:					
Hillview	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1878:					
Hamre	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
1938:					
Lakepark	---	Hedge cotoneaster, redosier dogwood, Tatarian honeysuckle, late lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1942:					
Forada	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.
1967:					
Hamerly	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
Vallers	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
1975:					
Oylen	Tatarian honeysuckle.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1997:					
Vallers	Redosier dogwood	Tatarian honeysuckle, American plum, common chokecherry, late lilac, northern whitecedar.	Hackberry, white spruce, Black Hills spruce.	Green ash, golden willow.	Siouxland cottonwood.
Hamerly	---	Siberian peashrub, Tatarian honeysuckle, blue spruce, late lilac.	Russian-olive, Black Hills spruce, Scotch pine, red splendor crabapple.	Hackberry, green ash, laurel willow.	Siouxland cottonwood.
Winger	---	Redosier dogwood	Black ash, green ash, tamarack, black spruce.	Eastern cottonwood, golden willow.	Robusta cottonwood.

WINDBREAK SUITABILITY GROUPS

(Suitable shrubs and trees with their mature heights are listed in the "Windbreaks and Environmental Plantings" table. Absence of an entry indicates that a windbreak suitability group is not assigned)

Map symbol and soil name	Windbreak suitability group
20B, 20C2, 20E:	
Chapett	3
26:	
Aazdahl	1
33B:	
Barnes	3
36:	
Flom	2
38B, 38C, 38E:	
Waukon	3
40B, 40C, 40E:	
Nebish	3
47:	
Colvin	2K
63:	
Rockwell	2K
108:	
McIntosh	1K
111:	
Hangaard	2
121:	
Wykeham	1
125:	
Beltrami	1
133A, 133B, 133C, 133E:	
Dalbo	4
137:	
Dovray	2W
141B, 141C:	
Egeland	5
168B, 168C2, 168D2, 168E:	
Forman	3
171B:	
Formdale	3
180:	
Gonvick	1
184:	
Hamerly	1K

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
191:	
Epoufette	2
202:	
Meehan	1
207D:	
Nymore	7
267B, 267C, 267E:	
Snellman	3
315A, 315B:	
Bootlake	6G
332B:	
Sugarbush	6G
335:	
Urness	2W
339:	
Fordville	6G
344:	
Quam	2W
351:	
Colvin	2W
375:	
Forada	2
398:	
Winger	2W
406A, 406B:	
Dorset	6G
413:	
Osakis	1
418:	
Lamoure	2K
422B, 422C:	
Bygland	4
503B, 503C, 503E:	
Balmlake	5
508:	
Wyndmere	1K
540:	
Seelyeville	2H
541:	
Rifle	2H
544:	
Cathro	2H

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
564:	
Friendship	7
567A, 567B:	
Verndale	7
579C2:	
Formdale	3
Langhei	8
Sandberg	7
624:	
Rosy	1
701:	
Runeberg	2W
711B, 711C:	
Arvilla	6G
Sandberg	7
718B, 718C, 718E:	
Naytahwaush	4
721E:	
Corliss	7
746:	
Haslie	2H
747B:	
Audubon	4
753D, 753E:	
Abbeylake	7
765:	
Smiley	2
767:	
Auganaush	2
775B, 775C:	
Sugarbush	6G
Two Inlets	7
776B, 776C, 776E:	
Snellman	3
Sugarbush	6G
778B, 778C:	
Dorset	6G
Corliss	7

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
780B, 780C2, 780D2:	
Audubon	4
Boyerlake	4
785:	
Hamerly	1K
Winger	2K
786:	
Winger	2K
Hamerly	1K
Colvin	2K
797:	
Mooselake	2H
Lupton	2H
867B, 867C, 867E:	
Graycalm	7
Menahga	7
903B, 903C2:	
Barnes	3
Langhei	8
931C2:	
Formdale	3
Langhei	8
942D2:	
Langhei	8
Barnes	3
943D2, 943E:	
Langhei	8
Formdale	3
951B, 951C, 951E:	
Nebish	3
Sugarbush	6G
1015:	
Udipsamments.	
1016, 1027:	
Udorthents.	
1030:	
Pits.	
Udipsamments.	

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
1104B, 1104C:	
Waukon	3
Dorset	6G
1111:	
Nidaros	10
1113:	
Haslie	10
Seelyeville	10
Cathro	10
1125B, 1125C:	
Sverdrup	6G
Abbeylake	7
1126B:	
Verndale	7
Nymore	7
1127A, 1127B:	
Bootlake	7
Graycalm	7
1128:	
Cathro	10
1129:	
Lindaas	2
1130:	
Wolverton	1K
1131B:	
Verndale	7
Abbeylake	7
1132B, 1132C, 1132E:	
Eagleview	7
Balmlake	5
1135:	
Foxlake	2
1136:	
Nidaros	2H
1137B, 1137C, 1137D, 1137E:	
Birchlake	4
1138:	
Rushlake	1
Hangaard	2

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
1140B, 1140C:	
Eagleview	7
Snellman	3
1149:	
Hamerly	1K
1195B, 1195C, 1195E:	
Sybil	6G
Eagleview	7
1196B, 1196C, 1196E:	
Lida	6G
Two Inlets	7
1200:	
Egglake	2
1201C, 1201E:	
Sugarbush	6G
Snellman	3
1210:	
Paddock	2
Epoufette	2
1211:	
Egglake	2
Cathro	2H
1225:	
Wykeham	1
Karlstad	1
1227:	
Quam	10
Cathro	10
Urness	10
1230:	
Haslie	10
Nidaros	10
1234B:	
Formdale	3
Buse	8
1235B:	
Formdale	3
Buse	8
Sandberg	7

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
1236B, 1236C, 1236E:	
Eagleview	7
1238E:	
Two Inlets	7
Sugarbush	6G
1242D:	
Sandberg	7
Arvilla	6G
1243B, 1243C, 1243E:	
Sol	3
1244B, 1244C, 1244E:	
Sol	3
Sugarbush	6G
1246:	
Winger	2K
1247D:	
Corliss	7
Dorset	6G
1248C:	
Nymore	7
Verndale	7
1249C:	
Graycalm	7
Bootlake	6G
1250C:	
Abbeylake	7
Verndale	7
1251:	
Lamoure	2
1252B:	
Bootlake	6G
Eagleview	7
1263C:	
Eagleview	7
Bootlake	6G
1291:	
Sedgeville	10
1306:	
Karlstad	1

WINDBREAK SUITABILITY GROUPS--Continued

Map symbol and soil name	Windbreak suitability group
1317:	
Vallers	2K
1318:	
Darnen	3
1319B, 1319C, 1319D:	
Rockwood	4F
1320B:	
Blowers	4F
1321:	
Paddock	2
1365:	
Hillview	2
1825B:	
Seelyeville	10
1878:	
Hamre	2W
1938:	
Lakepark	2
1942:	
Forada	2W
1967:	
Hamerly	1K
Vallers	2K
1975:	
Oylen	1
1997:	
Vallers	2K
Hamerly	1K
Winger	2W

Forest Land

Allen Wickman, private forest management specialist, Minnesota Department of Natural Resources, helped prepare this section.

Forested areas cover approximately 323,000 acres, or 39 percent of the total land area of Becker County. About 59 percent of the forest land is privately owned, and 41 percent is publicly owned. Of the publicly owned lands, 64,000 acres is county owned, 36,600 acres is owned by the State of Minnesota, 3,900 acres is Indian land, and 23,300 acres is Federal land.

The highly variable soil types and terrain conditions in Becker County support a large variety of timber types. Most tree species can grow under a wide variety of soil conditions. Aspen is the dominant tree species in Becker County. It makes up 48 percent of the commercial forest land. Other hardwood forest types, which include maple, basswood, red oak, bur oak, paper birch, elm, and ash, make up about 35 percent. Softwood forest types, which include tamarack, jack pine, balsam fir, black spruce, white spruce, red pine, and white pine, make up about 17 percent of the commercial forest land (fig. II-3).

The forested areas in the western half of Becker County consist mainly of hardwood forest types. Aspen, maple, basswood, red oak, and bur oak are the primary tree species in these areas. Red oak has the highest timber value of any of the hardwoods grown in the county. Sugar maple has the lowest value because of frequent frost cracks.

Most conifers are on the coarser textured glacial outwash soils in the eastern half of Becker County. Jack pine and red pine commonly grow on the most droughty sites. Conifers that prefer the moister, finer textured soils include white pine, white spruce, and balsam fir. Tamarack and black spruce typically grow in depressional areas of organic soils.

Forest Land Management Considerations

Information about the hazards and limitations that should be considered in areas used as forest land are given in the tables "Forest Land Harvest Equipment Considerations," "Forest Haul Road Considerations," "Forest Log Landing Considerations," and "Forest Land Site Preparation and Planting Considerations."

Forest Land Harvest Equipment Considerations

An explanation of the criteria for each of the considerations listed in the table is given in the following paragraphs.

Slope.—The upper slope limit is more than 15 percent.

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Depth to hard rock.—The depth to hard bedrock is less than 10 inches.

Rubbly surface.—The word "rubbly" is in the map unit name.

Surface stones.—The words "extremely stony" are in the map unit name.

Surface boulders.—The word "bouldery" is in the map unit name.

Areas of rock outcrop.—The words "Rock outcrop" are in the map unit name.

Susceptible to rutting and wheel slippage (low strength).—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Poor traction (loose sandy material).—The USDA texture includes sands or loamy sands in any layer at a depth of 10 inches or less.

Forest Haul Road Considerations

An explanation of the criteria for each of the considerations listed in the table is given in the following paragraphs.

Slope.—The slope is 8 percent or more (fig. II-4).

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Depth to hard rock.—The depth to hard bedrock is less than 20 inches.

Depth to soft rock.—The depth to soft bedrock is less than 20 inches.

Figure II-3.—A stand of red pine in an area of Eagleview loamy sand, 1 to 8 percent slopes. This species is adapted to droughty soils.

Surface boulders.—The word "bouldery" is in the map unit name.

Areas of rock outcrop.—The words "Rock outcrop" are in the map unit name.

Low bearing strength.—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Rubbly surface.—The word "rubbly" is in the map unit name.

Forest Log Landing Considerations

An explanation of the criteria for each of the considerations listed in the table is given in the following paragraphs.

Slope.—The slope is more than 3 percent.

Flooding.—The map unit component is occasionally flooded or frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Surface boulders.—The word "bouldery" is in the map unit name.

Areas of rock outcrop.—The words "Rock outcrop" are in the map unit name.

Susceptible to rutting and wheel slippage (low strength).—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Rubbly surface.—The word "rubbly" is in the map unit name.

Forest Land Site Preparation and Planting Considerations

An explanation of the criteria for each of the considerations listed in the table is given in the following paragraphs.

Slope.—The upper slope limit is more than 15 percent.

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Figure II-4.—A logging road in an area of Eagleview loamy sand, 8 to 15 percent slopes. Because of the slope, erosion is a problem and ruts have formed.

Depth to hard rock.—The depth to hard bedrock is less than 20 inches.

Surface stones.—The word "stony" is in the map unit name.

Surface boulders.—The word "bouldery" is in the map unit name.

Areas of rock outcrop.—The words "Rock outcrop" are in the map unit name.

Water erosion.—The slope is 8 percent or more.

Potential poor tilth and compaction.—The AASHTO classification is A-6 or A-7 in the upper 10 inches.

Rubbly surface.—The word "rubbly" is in the map unit name.

Cobbly surface.—The word "cobbly" is in the map unit name.

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest land harvest equipment considerations
20B, 20C2:	
Chapett	Susceptible to rutting and wheel slippage
20E:	
Chapett	Slope Susceptible to rutting and wheel slippage
38B, 38C:	
Waukon	Susceptible to rutting and wheel slippage
38E:	
Waukon	Slope Susceptible to rutting and wheel slippage
40B, 40C:	
Nebish	Susceptible to rutting and wheel slippage
40E:	
Nebish	Slope Susceptible to rutting and wheel slippage
121:	
Wykeham	Susceptible to rutting and wheel slippage
125:	
Beltrami	Susceptible to rutting and wheel slippage
133A, 133B, 133C:	
Dalbo	Susceptible to rutting and wheel slippage
133E:	
Dalbo	Slope Susceptible to rutting and wheel slippage
168B, 168C2:	
Forman	Susceptible to rutting and wheel slippage
168D2, 168E:	
Forman	Slope Susceptible to rutting and wheel slippage
180:	
Gonvick	Susceptible to rutting and wheel slippage
191:	
Epoufette	Poor traction (loose sandy material) Wetness
202:	
Meehan	Poor traction (loose sandy material) Wetness
207D:	
Nymore	Poor traction (loose sandy material) Slope
267B, 267C:	
Snellman	Susceptible to rutting and wheel slippage

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
267E:	
Snellman	Slope Susceptible to rutting and wheel slippage
315A, 315B:	
Bootlake	Poor traction (loose sandy material)
332B:	
Sugarbush	Poor traction (loose sandy material)
406A, 406B:	
Dorset	Susceptible to rutting and wheel slippage
422B, 422C:	
Bygland	Susceptible to rutting and wheel slippage
503B, 503C:	
Balmlake	No major considerations or hazards
503E:	
Balmlake	Slope
540:	
Seelyeville	Susceptible to rutting and wheel slippage Wetness
541:	
Rifle	Susceptible to rutting and wheel slippage Wetness
564:	
Friendship	Poor traction (loose sandy material)
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	Susceptible to rutting and wheel slippage
701:	
Runeberg	Susceptible to rutting and wheel slippage Wetness
718B, 718C:	
Naytahwaush	Susceptible to rutting and wheel slippage
718E:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
721E:	
Corliss	Poor traction (loose sandy material) Slope
753D, 753E:	
Abbeylake	Poor traction (loose sandy material) Slope
767:	
Auganaush	Susceptible to rutting and wheel slippage Wetness
775B, 775C:	
Sugarbush	Poor traction (loose sandy material)

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
775B, 775C:	
Two Inlets	Poor traction (loose sandy material)
776B, 776C:	
Snellman	Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material)
776E:	
Snellman	Slope Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material) Slope
778B, 778C:	
Dorset	Susceptible to rutting and wheel slippage
Corliss	Poor traction (loose sandy material)
797:	
Mooselake	Susceptible to rutting and wheel slippage Wetness
Lupton	Susceptible to rutting and wheel slippage Wetness
867B, 867C:	
Graycalm	Poor traction (loose sandy material)
Menahga	Poor traction (loose sandy material)
867E:	
Graycalm	Poor traction (loose sandy material) Slope
Menahga	Poor traction (loose sandy material) Slope
951B, 951C:	
Nebish	Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material)
951E:	
Nebish	Slope Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material) Slope
1104B, 1104C:	
Waukon	Susceptible to rutting and wheel slippage
Dorset	Susceptible to rutting and wheel slippage
1111:	
Nidaros	Flooding Susceptible to rutting and wheel slippage Wetness
1125B, 1125C:	
Sverdrup	Poor traction (loose sandy material)

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1125B, 1125C:	
Abbeylake	Poor traction (loose sandy material)
1126B:	
Verndale	No major considerations or hazards
Nymore	Poor traction (loose sandy material)
1127A, 1127B:	
Bootlake	Poor traction (loose sandy material)
Graycalm	Poor traction (loose sandy material)
1129:	
Lindaas	Susceptible to rutting and wheel slippage Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	Poor traction (loose sandy material)
1132B, 1132C:	
Eagleview	Poor traction (loose sandy material)
Balmlake	No major considerations or hazards
1132E:	
Eagleview	Poor traction (loose sandy material) Slope
Balmlake	Slope
1136:	
Nidaros	Susceptible to rutting and wheel slippage Wetness
1137B, 1137C:	
Birchlake	Susceptible to rutting and wheel slippage Wetness
1137D, 1137E:	
Birchlake	Slope Susceptible to rutting and wheel slippage Wetness
1138:	
Rushlake	Poor traction (loose sandy material)
Hangaard	Wetness
1140B, 1140C:	
Eagleview	Poor traction (loose sandy material)
Snellman	Susceptible to rutting and wheel slippage
1195B, 1195C:	
Sybil	Poor traction (loose sandy material)
Eagleview	Poor traction (loose sandy material)

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1195E:	
Sybil	Slope
Eagleview	Poor traction (loose sandy material) Slope
1196B:	
Lida	No major considerations or hazards
Two Inlets	No major considerations or hazards
1196C:	
Lida	No major considerations or hazards
Two Inlets	Poor traction (loose sandy material)
1196E:	
Lida	Slope
Two Inlets	Poor traction (loose sandy material) Slope
1200:	
Egglake	Susceptible to rutting and wheel slippage Wetness
1201C:	
Sugarbush	Poor traction (loose sandy material)
Snellman	Susceptible to rutting and wheel slippage
1201E:	
Sugarbush	Poor traction (loose sandy material) Slope
Snellman	Slope Susceptible to rutting and wheel slippage
1210:	
Paddock	Wetness
Epoufette	Poor traction (loose sandy material) Wetness
1211:	
Egglake	Susceptible to rutting and wheel slippage Wetness
Cathro	Susceptible to rutting and wheel slippage Wetness
1225:	
Wykeham	Susceptible to rutting and wheel slippage
Karlstad	No major considerations or hazards
1236B, 1236C:	
Eagleview	Poor traction (loose sandy material)
1236E:	
Eagleview	Poor traction (loose sandy material) Slope

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1238E:	
Two Inlets	Poor traction (loose sandy material) Slope
Sugarbush	Poor traction (loose sandy material) Slope
1243B, 1243C:	
Sol	Susceptible to rutting and wheel slippage
1243E:	
Sol	Slope Susceptible to rutting and wheel slippage
1244B, 1244C:	
Sol	No major considerations or hazards
Sugarbush	Poor traction (loose sandy material)
1244E:	
Sol	Slope
Sugarbush	Poor traction (loose sandy material) Slope
1247D:	
Corliss	Poor traction (loose sandy material) Slope
Dorset	Slope Susceptible to rutting and wheel slippage
1248C:	
Nymore	Poor traction (loose sandy material)
Verndale	No major considerations or hazards
1249C:	
Graycalm	Poor traction (loose sandy material)
Bootlake	Poor traction (loose sandy material)
1250C:	
Abbeylake	Poor traction (loose sandy material)
Verndale	No major considerations or hazards
1252B:	
Bootlake	Poor traction (loose sandy material)
Eagleview	Poor traction (loose sandy material)
1263C:	
Eagleview	Poor traction (loose sandy material)
Bootlake	Poor traction (loose sandy material)
1291:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
1306:	
Karlstad	No major considerations or hazards

FOREST LAND HARVEST EQUIPMENT CONSIDERATIONS--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1319B, 1319C:	
Rockwood	Poor traction (loose sandy material)
1319D:	
Rockwood	Poor traction (loose sandy material) Slope
1320B:	
Blowers	Wetness
1321:	
Paddock	Wetness
1365:	
Hillview	Poor traction (loose sandy material) Wetness
1878:	
Hamre	Susceptible to rutting and wheel slippage Wetness
1975:	
Oylen	No major considerations or hazards

FOREST HAUL ROAD CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest haul road considerations
20B, 20C2, 20E:	
Chapett	Low bearing strength Slope
38B, 38C, 38E:	
Waukon	Low bearing strength Slope
40B, 40C, 40E:	
Nebish	Low bearing strength Slope
121:	
Wykeham	Low bearing strength
125:	
Beltrami	Low bearing strength
133A:	
Dalbo	Low bearing strength
133B, 133C, 133E:	
Dalbo	Low bearing strength Slope
168B:	
Forman	Low bearing strength
168C2, 168D2, 168E:	
Forman	Low bearing strength Slope
180:	
Gonvick	Low bearing strength
191:	
Epoufette	Wetness
202:	
Meehan	Wetness
207D:	
Nymore	Slope
267B, 267C, 267E:	
Snellman	Low bearing strength Slope
315A, 315B:	
Bootlake	No major considerations or hazards
332B:	
Sugarbush	Slope
406A, 406B:	
Dorset	Low bearing strength
422B:	
Bygland	Low bearing strength

FOREST HAUL ROAD CONSIDERATIONS--Continued

Map symbol and soil name	Forest haul road considerations
422C:	
Bygland	Low bearing strength Slope
503B, 503C, 503E:	
Balmlake	Slope
540:	
Seelyeville	Low bearing strength Wetness
541:	
Rifle	Low bearing strength Wetness
564:	
Friendship	No major considerations or hazards
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	Low bearing strength
701:	
Runeberg	Low bearing strength Wetness
718B, 718C, 718E:	
Naytahwaush	Low bearing strength Slope
721E:	
Corliss	Slope
753D, 753E:	
Abbeylake	Slope
767:	
Auganaush	Low bearing strength Wetness
775B, 775C:	
Sugarbush	Slope
Two Inlets	Slope
776B, 776C, 776E:	
Snellman	Low bearing strength Slope
Sugarbush	Slope
778B:	
Dorset	Low bearing strength
Corliss	No major considerations or hazards
778C:	
Dorset	Low bearing strength Slope
Corliss	Slope

FOREST HAUL ROAD CONSIDERATIONS--Continued

Map symbol and soil name	Forest haul road considerations
797:	
Mooselake	Low bearing strength Wetness
Lupton	Low bearing strength Wetness
867B, 867C, 867E:	
Graycalm	Slope
Menahga	Slope
951B, 951C, 951E:	
Nebish	Low bearing strength Slope
Sugarbush	Slope
1104B, 1104C:	
Waukon	Low bearing strength Slope
Dorset	Low bearing strength Slope
1111:	
Nidaros	Flooding Low bearing strength Wetness
1125B:	
Sverdrup	No major considerations or hazards
Abbeylake	No major considerations or hazards
1125C:	
Sverdrup	Slope
Abbeylake	Slope
1126B:	
Verndale	No major considerations or hazards
Nymore	No major considerations or hazards
1127A:	
Bootlake	No major considerations or hazards
Graycalm	No major considerations or hazards
1127B:	
Bootlake	Slope
Graycalm	Slope
1129:	
Lindaas	Low bearing strength Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	No major considerations or hazards

FOREST HAUL ROAD CONSIDERATIONS--Continued

Map symbol and soil name	Forest haul road considerations
1132B, 1132C, 1132E:	
Eagleview	Slope
Balmlake	Slope
1136:	
Nidaros	Low bearing strength Wetness
1137B:	
Birchlake	Low bearing strength Wetness
1137C, 1137D, 1137E:	
Birchlake	Low bearing strength Slope Wetness
1138:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1140B, 1140C:	
Eagleview	Slope
Snellman	Low bearing strength Slope
1195B, 1195C, 1195E:	
Sybil	Slope
Eagleview	Slope
1196B, 1196C, 1196E:	
Lida	Slope
Two Inlets	Slope
1200:	
Egglake	Low bearing strength Wetness
1201C, 1201E:	
Sugarbush	Slope
Snellman	Low bearing strength Slope
1210:	
Paddock	Wetness
Epoufette	Wetness
1211:	
Egglake	Low bearing strength Wetness
Cathro	Low bearing strength Wetness

FOREST HAUL ROAD CONSIDERATIONS--Continued

Map symbol and soil name	Forest haul road considerations
1225:	
Wykeham	Low bearing strength
Karlstad	No major considerations or hazards
1236B, 1236C, 1236E:	
Eagleview	Slope
1238E:	
Two Inlets	Slope
Sugarbush	Slope
1243B, 1243C, 1243E:	
Sol	Low bearing strength Slope
1244B, 1244C, 1244E:	
Sol	Slope
Sugarbush	Slope
1247D:	
Corliss	Slope
Dorset	Low bearing strength Slope
1248C:	
Nymore	Slope
Verndale	Slope
1249C:	
Graycalm	Slope
Bootlake	Slope
1250C:	
Abbeylake	Slope
Verndale	Slope
1252B:	
Bootlake	Slope
Eagleview	Slope
1263C:	
Eagleview	Slope
Bootlake	Slope
1291:	
Sedgeville	Flooding Low bearing strength Wetness
1306:	
Karlstad	No major considerations or hazards
1319B:	
Rockwood	No major considerations or hazards

FOREST HAUL ROAD CONSIDERATIONS--Continued

Map symbol and soil name	Forest haul road considerations
1319C, 1319D:	
Rockwood	Slope
1320B:	
Blowers	Wetness
1321:	
Paddock	Wetness
1365:	
Hillview	Wetness
1878:	
Hamre	Low bearing strength Wetness
1975:	
Oylen	No major considerations or hazards

FOREST LOG LANDING CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest log landing considerations
20B, 20C2, 20E:	
Chapett	Slope Susceptible to rutting and wheel slippage
38B, 38C, 38E:	
Waukon	Slope Susceptible to rutting and wheel slippage
40B, 40C, 40E:	
Nebish	Slope Susceptible to rutting and wheel slippage
121:	
Wykeham	Susceptible to rutting and wheel slippage
125:	
Beltrami	Susceptible to rutting and wheel slippage
133A:	
Dalbo	Susceptible to rutting and wheel slippage
133B, 133C, 133E:	
Dalbo	Slope Susceptible to rutting and wheel slippage
168B, 168C2, 168D2, 168E:	
Forman	Slope Susceptible to rutting and wheel slippage
180:	
Gonvick	Susceptible to rutting and wheel slippage
191:	
Epoufette	Wetness
202:	
Meehan	Wetness
207D:	
Nymore	Slope
267B, 267C, 267E:	
Snellman	Slope Susceptible to rutting and wheel slippage
315A:	
Bootlake	No major considerations or hazards
315B:	
Bootlake	Slope
332B:	
Sugarbush	Slope
406A:	
Dorset	Susceptible to rutting and wheel slippage
406B:	
Dorset	Slope Susceptible to rutting and wheel slippage

FOREST LOG LANDING CONSIDERATIONS--Continued

Map symbol and soil name	Forest log landing considerations
422B, 422C:	
Bygland	Slope Susceptible to rutting and wheel slippage
503B, 503C, 503E:	
Balmlake	Slope
540:	
Seelyeville	Susceptible to rutting and wheel slippage Wetness
541:	
Rifle	Susceptible to rutting and wheel slippage Wetness
564:	
Friendship	No major considerations or hazards
567A:	
Verndale	No major considerations or hazards
567B:	
Verndale	Slope
624:	
Rosy	Susceptible to rutting and wheel slippage
701:	
Runeberg	Susceptible to rutting and wheel slippage Wetness
718B, 718C, 718E:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
721E:	
Corliss	Slope
753D, 753E:	
Abbeylake	Slope
767:	
Auganaush	Susceptible to rutting and wheel slippage Wetness
775B, 775C:	
Sugarbush	Slope
Two Inlets	Slope
776B, 776C, 776E:	
Snellman	Slope Susceptible to rutting and wheel slippage
Sugarbush	Slope
778B, 778C:	
Dorset	Slope Susceptible to rutting and wheel slippage
Corliss	Slope

FOREST LOG LANDING CONSIDERATIONS--Continued

Map symbol and soil name	Forest log landing considerations
797:	
Mooselake	Susceptible to rutting and wheel slippage Wetness
Lupton	Susceptible to rutting and wheel slippage Wetness
867B, 867C, 867E:	
Graycalm	Slope
Menahga	Slope
951B, 951C, 951E:	
Nebish	Slope Susceptible to rutting and wheel slippage
Sugarbush	Slope
1104B, 1104C:	
Waukon	Slope Susceptible to rutting and wheel slippage
Dorset	Slope Susceptible to rutting and wheel slippage
1111:	
Nidaros	Flooding Susceptible to rutting and wheel slippage Wetness
1125B, 1125C:	
Sverdrup	Slope
Abbeylake	Slope
1126B:	
Verndale	Slope
Nymore	Slope
1127A:	
Bootlake	No major considerations or hazards
Graycalm	No major considerations or hazards
1127B:	
Bootlake	Slope
Graycalm	Slope
1129:	
Lindaas	Susceptible to rutting and wheel slippage Wetness
1131B:	
Verndale	Slope
Abbeylake	Slope
1132B, 1132C, 1132E:	
Eagleview	Slope
Balmlake	Slope

FOREST LOG LANDING CONSIDERATIONS--Continued

Map symbol and soil name	Forest log landing considerations
1136:	
Nidaros	Susceptible to rutting and wheel slippage Wetness
1137B, 1137C, 1137D, 1137E:	
Birchlake	Slope Susceptible to rutting and wheel slippage Wetness
1138:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1140B, 1140C:	
Eagleview	Slope
Snellman	Slope Susceptible to rutting and wheel slippage
1195B, 1195C, 1195E:	
Sybil	Slope
Eagleview	Slope
1196B, 1196C, 1196E:	
Lida	Slope
Two Inlets	Slope
1200:	
Egglake	Susceptible to rutting and wheel slippage Wetness
1201C, 1201E:	
Sugarbush	Slope
Snellman	Slope Susceptible to rutting and wheel slippage
1210:	
Paddock	Wetness
Epoufette	Wetness
1211:	
Egglake	Susceptible to rutting and wheel slippage Wetness
Cathro	Susceptible to rutting and wheel slippage Wetness
1225:	
Wykeham	Susceptible to rutting and wheel slippage
Karlstad	No major considerations or hazards
1236B, 1236C, 1236E:	
Eagleview	Slope
1238E:	
Two Inlets	Slope

FOREST LOG LANDING CONSIDERATIONS--Continued

Map symbol and soil name	Forest log landing considerations
1238E:	
Sugarbush	Slope
1243B, 1243C, 1243E:	
Sol	Slope Susceptible to rutting and wheel slippage
1244B, 1244C, 1244E:	
Sol	Slope
Sugarbush	Slope
1247D:	
Corliss	Slope
Dorset	Slope Susceptible to rutting and wheel slippage
1248C:	
Nymore	Slope
Verndale	Slope
1249C:	
Graycalm	Slope
Bootlake	Slope
1250C:	
Abbeylake	Slope
Verndale	Slope
1252B:	
Bootlake	Slope
Eagleview	Slope
1263C:	
Eagleview	Slope
Bootlake	Slope
1291:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
1306:	
Karlstad	No major considerations or hazards
1319B, 1319C, 1319D:	
Rockwood	Slope
1320B:	
Blowers	Slope Wetness
1321:	
Paddock	Wetness
1365:	
Hillview	Wetness

FOREST LOG LANDING CONSIDERATIONS--Continued

Map symbol and soil name	Forest log landing considerations
1878:	
Hamre	Susceptible to rutting and wheel slippage Wetness
1975:	
Oylen	No major considerations or hazards

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Site preparation and planting considerations
20B, 20C2:	
Chapett	Water erosion
20E:	
Chapett	Slope Water erosion
38B, 38C:	
Waukon	Potential poor tilth and compaction Water erosion
38E:	
Waukon	Potential poor tilth and compaction Slope Water erosion
40B, 40C:	
Nebish	Water erosion
40E:	
Nebish	Slope Water erosion
121:	
Wykeham	No major considerations or hazards
125:	
Beltrami	No major considerations or hazards
133A:	
Dalbo	No major considerations or hazards
133B, 133C:	
Dalbo	Water erosion
133E:	
Dalbo	Slope Water erosion
168B:	
Forman	Potential poor tilth and compaction
168C2:	
Forman	Potential poor tilth and compaction Water erosion
168D2, 168E:	
Forman	Potential poor tilth and compaction Slope Water erosion
180:	
Gonvick	No major considerations or hazards
191:	
Epoufette	Wetness
202:	
Meehan	Wetness

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
207D:	
Nymore	Slope Water erosion
267B, 267C:	
Snellman	Water erosion
267E:	
Snellman	Slope Water erosion
315A, 315B:	
Bootlake	No major considerations or hazards
332B:	
Sugarbush	Water erosion
406A, 406B:	
Dorset	No major considerations or hazards
422B:	
Bygland	Potential poor tilth and compaction
422C:	
Bygland	Potential poor tilth and compaction Water erosion
503B, 503C:	
Balmlake	Water erosion
503E:	
Balmlake	Slope Water erosion
540:	
Seelyeville	Wetness
541:	
Rifle	Wetness
564:	
Friendship	No major considerations or hazards
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	No major considerations or hazards
701:	
Runeberg	Potential poor tilth and compaction Wetness
718B, 718C:	
Naytahwaush	Potential poor tilth and compaction Water erosion
718E:	
Naytahwaush	Potential poor tilth and compaction Slope Water erosion

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
721E:	
Corliss	Slope Water erosion
753D, 753E:	
Abbeylake	Slope Water erosion
767:	
Auganaush	Potential poor tilth and compaction Wetness
775B, 775C:	
Sugarbush	Water erosion
Two Inlets	Water erosion
776B, 776C:	
Snellman	Water erosion
Sugarbush	Water erosion
776E:	
Snellman	Slope Water erosion
Sugarbush	Slope Water erosion
778B:	
Dorset	No major considerations or hazards
Corliss	No major considerations or hazards
778C:	
Dorset	Water erosion
Corliss	Water erosion
797:	
Mooselake	Wetness
Lupton	Wetness
867B, 867C:	
Graycalm	Water erosion
Menahga	Water erosion
867E:	
Graycalm	Slope Water erosion
Menahga	Slope Water erosion
951B, 951C:	
Nebish	Water erosion
Sugarbush	Water erosion
951E:	
Nebish	Slope Water erosion

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
951E:	
Sugarbush	Slope Water erosion
1104B, 1104C:	
Waukon	Potential poor tilth and compaction Water erosion
Dorset	Water erosion
1111:	
Nidaros	Flooding Wetness
1125B:	
Sverdrup	No major considerations or hazards
Abbeylake	No major considerations or hazards
1125C:	
Sverdrup	Water erosion
Abbeylake	Water erosion
1126B:	
Verndale	No major considerations or hazards
Nymore	No major considerations or hazards
1127A:	
Bootlake	No major considerations or hazards
Graycalm	No major considerations or hazards
1127B:	
Bootlake	Water erosion
Graycalm	Water erosion
1129:	
Lindaas	Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	No major considerations or hazards
1132B, 1132C:	
Eagleview	Water erosion
Balmlake	Water erosion
1132E:	
Eagleview	Slope Water erosion
Balmlake	Slope Water erosion
1136:	
Nidaros	Wetness

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
1137B:	
Birchlake	Potential poor tilth and compaction Wetness
1137C:	
Birchlake	Potential poor tilth and compaction Water erosion Wetness
1137D, 1137E:	
Birchlake	Potential poor tilth and compaction Slope Water erosion Wetness
1138:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1140B, 1140C:	
Eagleview	Water erosion
Snellman	Water erosion
1195B, 1195C:	
Sybil	Water erosion
Eagleview	Water erosion
1195E:	
Sybil	Slope Water erosion
Eagleview	Slope Water erosion
1196B, 1196C:	
Lida	Water erosion
Two Inlets	Water erosion
1196E:	
Lida	Slope Water erosion
Two Inlets	Slope Water erosion
1200:	
Egglake	Wetness
1201C:	
Sugarbush	Water erosion
Snellman	Water erosion
1201E:	
Sugarbush	Slope Water erosion
Snellman	Slope Water erosion

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
1210:	
Paddock	Wetness
Epoufette	Wetness
1211:	
Egglake	Wetness
Cathro	Wetness
1225:	
Wykeham	No major considerations or hazards
Karlstad	No major considerations or hazards
1236B, 1236C:	
Eagleview	Water erosion
1236E:	
Eagleview	Slope Water erosion
1238E:	
Two Inlets	Slope Water erosion
Sugarbush	Slope Water erosion
1243B, 1243C:	
Sol	Surface stones Water erosion
1243E:	
Sol	Slope Surface stones Water erosion
1244B, 1244C:	
Sol	Surface stones Water erosion
Sugarbush	Surface stones Water erosion
1244E:	
Sol	Slope Surface stones Water erosion
Sugarbush	Slope Surface stones Water erosion
1247D:	
Corliss	Slope Water erosion
Dorset	Slope Water erosion

FOREST LAND SITE PREPARATION AND PLANTING CONSIDERATIONS--Continued

Map symbol and soil name	Site preparation and planting considerations
1248C:	
Nymore	Water erosion
Verndale	Water erosion
1249C:	
Graycalm	Water erosion
Bootlake	Water erosion
1250C:	
Abbeylake	Water erosion
Verndale	Water erosion
1252B:	
Bootlake	Water erosion
Eagleview	Water erosion
1263C:	
Eagleview	Water erosion
Bootlake	Water erosion
1291:	
Sedgeville	Flooding Potential poor tilth and compaction Wetness
1306:	
Karlstad	No major considerations or hazards
1319B:	
Rockwood	Surface stones
1319C:	
Rockwood	Surface stones Water erosion
1319D:	
Rockwood	Slope Surface stones Water erosion
1320B:	
Blowers	Surface stones Wetness
1321:	
Paddock	Surface stones Wetness
1365:	
Hillview	Wetness
1878:	
Hamre	Wetness
1975:	
Oylen	No major considerations or hazards

Recreation

Greg A. Hildenbrand, executive director, Detroit Lakes Regional Chamber of Commerce, helped prepare this section.

Becker County is a prime tourist area because of the natural beauty of its lakes and forests. There are 412 lakes within a 25-mile radius of the city of Detroit Lakes. These lakes are used extensively for fishing, boating, swimming, and other recreational activities. Approximately 100 resorts along these lakes host many tourists during the summer. The city of Detroit Lakes has a mile-long public beach that attracts many tourists (fig. II-5).

Approximately 181,600 acres of county, State, and Federal lands in Becker County are available to the public for hunting and other recreational activities. The largest contiguous area of public land is the Tamarack National Wildlife Refuge, which has a surface area of 42,700 acres of land and water. The refuge is a nesting ground for ducks, geese, and grouse. Parts of the refuge are a sanctuary for waterfowl during their migrations. Hunting of white-tailed deer, ruffed grouse, and waterfowl is permitted in specified areas on the refuge. The refuge contains a large population of nesting bald eagles.

The county has nine public golf courses, about 200 miles of snowmobile trails, and 50 miles of cross-country skiing trails. Detroit Mountain, near Detroit Lakes, is a downhill skiing area.

The soils of the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be

Figure II-5.—This public beach is in an area of Rushlake and Hangaard soils, lake beaches, on Little Detroit Lake. The many lakes in Becker County provide numerous opportunities for recreational activities.

required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table "Recreational

Development" can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table "Building Site Development" and interpretations for septic tank absorption fields in the table "Sanitary Facilities."

RECREATIONAL DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
20B:					
Chapett	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
20C2:					
Chapett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
20E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
26:					
Aazdahl	Slight	Slight	Slight	Slight	Slight.
33B:					
Barnes	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
36:					
Flom	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
38B:					
Waukon	Slight	Slight	Moderate: slope.	Slight	Slight.
38C:					
Waukon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
38E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
40B:					
Nebish	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
40C:					
Nebish	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
40E:					
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
47:					
Colvin	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
63:					
Rockwell	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
108:					
McIntosh	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
111:					
Hangaard	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
121:					
Wykeham	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
125:					
Beltrami	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
133A:					
Dalbo	Slight	Slight	Slight	Severe: erodes easily.	Slight.
133B:					
Dalbo	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
133C:					
Dalbo	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
133E:					
Dalbo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
137:					
Dovray	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
141B:					
Egeland	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
141C:					
Egeland	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
168B:					
Forman	Slight	Slight	Moderate: slope.	Slight	Slight.
168C2:					
Forman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
168D2:					
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
168E:					
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
171B:					
Formdale	Slight	Slight	Moderate: slope.	Slight	Slight.
180:					
Gonvick	Slight	Slight	Moderate: slope.	Slight	Slight.
184:					
Hamerly	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
191:					
Epoufette	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
202:					
Meehan	Severe: wetness, too acid.	Severe: too acid.	Severe: wetness, too acid.	Moderate: wetness, too sandy.	Severe: too acid.
207D:					
Nymore	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
267B:					
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
267C:					
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
267E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
315A:					
Bootlake	Slight	Slight	Slight	Slight	Moderate: droughty.
315B:					
Bootlake	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
332B:					
Sugarbush	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
335:					
Urness	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
339:					
Fordville	Slight	Slight	Slight	Slight	Slight.
344:					
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
351:					
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
375:					
Forada	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
398:					
Winger	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
406A:					
Dorset	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
406B:					
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
413:					
Osakis	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
418:					
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
422B:					
Bygland	Slight	Slight	Moderate: slope.	Slight	Slight.
422C:					
Bygland	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
503B:					
Balmlake	Slight	Slight	Moderate: slope.	Slight	Slight.
503C:					
Balmlake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
503E:					
Balmlake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
508:					
Wyndmere	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
540:					
Seelyeville	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
541:					
Rifle	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
544:					
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
564:					
Friendship	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
567A:					
Verndale	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
567B:					
Verndale	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
579C2:					
Formdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Langhei	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Sandberg	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.
624:					
Rosy	Slight	Slight	Slight	Slight	Slight.
701:					
Runeberg	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
711B:					
Arvilla	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
711C:					
Arvilla	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Sandberg	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
718B:					
Naytahwaush	Slight	Slight	Moderate: slope.	Slight	Slight.
718C:					
Naytahwaush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
718E:					
Naytahwaush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
721E:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
746:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
747B:					
Audubon	Slight	Slight	Moderate: slope.	Slight	Slight.
753D:					
Abbeylake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
753E:					
Abbeylake	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
765:					
Smiley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
767:					
Auganaush	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
775B:					
Sugarbush	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Two Inlets	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
775C:					
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Two Inlets	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty, slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
776B:					
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Sugarbush	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
776C:					
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
776E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
778B:					
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Corliss	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Severe: droughty.
778C:					
Dorset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Corliss	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
780B:					
Audubon	Slight	Slight	Moderate: slope.	Slight	Slight.
Boyerlake	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
780C2:					
Audubon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Boyerlake	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
780D2:					
Audubon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
780D2:					
Boyerlake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
785:					
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Winger	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
786:					
Winger	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
797:					
Mooselake	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lupton	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.
867B:					
Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Severe: droughty.
Menahga	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
867C:					
Graycalm	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
Menahga	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
867E:					
Graycalm	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
Menahga	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
903B:					
Barnes	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Langhei	Slight	Slight	Moderate: slope.	Slight	Slight.
903C2:					
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
931C2:					
Formdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Langhei	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
942D2:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
943D2:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
943E:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
951B:					
Nebish	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Sugarbush	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
951C:					
Nebish	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
951E:					
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1015:					
Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
1016:					
Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1027:					
Udorthents.					
1030:					
Pits.					
Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
1104B:					
Waukon	Slight	Slight	Moderate: slope.	Slight	Slight.
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
1104C:					
Waukon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Dorset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1111:					
Nidaros	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
1113:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Seelyeville	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1125B:					
Sverdrup	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Abbeylake	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
1125C:					
Sverdrup	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Abbeylake	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
1126B:					
Verndale	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Nymore	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Severe: droughty.
1127A:					
Bootlake	Slight	Slight	Slight	Slight	Moderate: droughty.
Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
1127B:					
Bootlake	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Severe: droughty.
1128:					
Cathro	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1129:					
Lindaas	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1130:					
Wolverton	Slight	Slight	Slight	Slight	Slight.
1131B:					
Verndale	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1131B:					
Abbeylake	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
1132B:					
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
Balmlake	Slight	Slight	Moderate: slope.	Slight	Slight.
1132C:					
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Balmlake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
1132E:					
Eagleview	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Balmlake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1135:					
Foxlake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1136:					
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1137B:					
Birchlake	Slight	Slight	Moderate: slope.	Slight	Slight.
1137C:					
Birchlake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
1137D:					
Birchlake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1137E:					
Birchlake	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1138:					
Rushlake	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
Hangaard	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1140B:					
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
1140C:					
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
1149:					
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
1195B:					
Sybil	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
1195C:					
Sybil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
1195E:					
Sybil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Eagleview	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
1196B:					
Lida	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
Two Inlets	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
1196C:					
Lida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1196C:					
Two Inlets	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty, slope.
1196E:					
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Two Inlets	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
1200:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1201C:					
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
1201E:					
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1210:					
Paddock	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Epoufette	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
1211:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1225:					
Wykeham	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Karlstad	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1227:					
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1227:					
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Urness	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1230:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1234B:					
Formdale	Slight	Slight	Moderate: slope.	Slight	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1235B:					
Formdale	Slight	Slight	Moderate: slope.	Slight	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Sandberg	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
1236B:					
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
1236C:					
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
1236E:					
Eagleview	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
1238E:					
Two Inlets	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1242D:					
Sandberg	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1242D:					
Arvilla	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1243B:					
Sol	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
1243C:					
Sol	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
1243E:					
Sol	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1244B:					
Sol	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Sugarbush	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
1244C:					
Sol	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1244E:					
Sol	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1246:					
Winger	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1247D:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
Dorset	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1248C:					
Nymore	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
Verndale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1249C:					
Graycalm	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
Bootlake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1250C:					
Abbeylake	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
Verndale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1251:					
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
1252B:					
Bootlake	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
1263C:					
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Bootlake	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1291:					
Sedgeville	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
1306:					
Karlstad	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1317:					
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1318:					
Darnen	Slight	Slight	Slight	Slight	Slight.
1319B:					
Rockwood	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1319C:					
Rockwood	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
1319D:					
Rockwood	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1320B:					
Blowers	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Slight	Moderate: large stones.
1321:					
Paddock	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
1365:					
Hillview	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1825B:					
Seelyeville	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.
1878:					
Hamre	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1938:					
Lakepark	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1942:					
Forada	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1967:					
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1975:					
Oylen	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Slight	Moderate: droughty.
1997:					
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.

RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1997:					
Winger----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Wildlife Habitat

Earl Johnson, area wildlife manager, Minnesota Department of Natural Resources, helped prepare this section.

The soil and water resources of Becker County are the basis for a variety of vegetation communities that provide habitat for many wildlife species. The county is in an area of ecological transition between the prairie and the woodlands. This transition area is a result of the influences of climate, precipitation, and environmental factors. The eastern part of the county is dominated by a woodland landscape that provides habitat for forest and forest-edge wildlife species, such as ruffed grouse, woodcock, white-tailed deer, black bear, gray squirrel, and snowshoe hare. The major forest types are aspen and oak. These species produce the best habitat when they are managed in small, interspersed stands of various ages.

Woodland lakes and wetlands provide habitat for beaver, otter, mink, muskrat, common loons, Canada geese, wood duck, ring-necked duck, mallard, and common goldeneye. The western part of the county features prairie soils and abundant wetlands. It is inhabited by prairie wildlife, including pheasant, greater prairie chicken, Hungarian partridge, white-tailed deer, jackrabbit, Canada geese, and many species of ducks. Common duck species include wood duck, mallard, ring-necked duck, blue-winged teal, gadwall, redhead, and canvasback.

Although more than 99 percent of the native prairie has been plowed and is under intensive agricultural management, sizable remnants of native prairie habitat exist in the northwestern part of the county within Federal waterfowl production areas, State-owned wildlife management areas, and tracts privately owned by The Nature Conservancy. These prairie remnants support populations of rarely seen native grasses, flowers, and nongame mammals, birds, amphibians, reptiles, and insects.

Nongame wildlife species are abundant in Becker County. Populations of bald eagles and trumpeter swans are noteworthy. Bald eagles occupied 30 known nests in 1991. This number represents a three-fold increase over the known nests 10 years earlier. The trumpeter swan had disappeared from Minnesota since before 1900 because of market harvesting for meat and feathers. A restoration project was started in 1982 to reestablish this majestic bird to the marshes of Minnesota. From 1987 through 1991, about 152 swans have been released in Minnesota, including 139 in various marshes in Becker County. In 1991, ten pairs of swans successfully nested and reared 26 cygnets.

Becker County has abundant public lands that provide important habitat for wildlife. In the western half of the county are 51 federally owned waterfowl production areas covering about 11,000 acres. There are also 16 State-owned wildlife management areas making up about 7,600 acres. The Hamden Slough National Wildlife Refuge has 2,500 acres under Federal ownership. The eastern half of Becker County has 75,600 acres of tax-forfeited lands under county forest management and 45,000 acres of State-owned lands managed for timber and wildlife production. The federally owned Tamarack National Wildlife Refuge encompasses an area of 42,700 acres and is managed for waterfowl, wildlife, and timber production.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife

Figure II-6.—This area of Haslie, Seelyeville, and Cathro soils, ponded, provides good habitat for wetland wildlife.

food and cover. Examples are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestems, indiangrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, boxelder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are hawthorn, honeysuckle, American plum, redosier dogwood, chokecherry, serviceberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provide habitat or supply food in the

form of browse, seed, or fruit-like cones. Examples are pine, spruce, cedar, and tamarack.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Examples are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweeds, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, sharp-tailed grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, porcupine, raccoon, white-tailed deer, black bear, and moose.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas, bogs, or flood plains that support water-tolerant plants (fig. II-6). The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, muskrat, otter, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. The wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

WILDLIFE HABITAT

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
20B:												
Chapett	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
20C2:												
Chapett	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
20E:												
Chapett	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
26:												
Aazdahl	Good	Good	Good	Good	Good	---	Poor	Fair	Good	Fair	Poor	---
33B:												
Barnes	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
36:												
Flom	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Fair.
38B:												
Waukon	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
38C:												
Waukon	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
38E:												
Waukon	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
40B:												
Nebish	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
40C:												
Nebish	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
40E:												
Nebish	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
47:												
Colvin	Good	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Fair.
63:												
Rockwell	Fair	Fair	Good	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
108:												
McIntosh	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor	Good.
111:												
Hangaard	Poor	Fair	Fair	Fair	Poor	---	Good	Good	Fair	Fair	Good	---
121:												
Wykeham	Good	Good	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
125:												
Beltrami	Good	Good	Good	Good	Fair	---	Very poor.	Very poor.	Good	Good	Very poor.	---
133A:												
Dalbo	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
133B:												
Dalbo	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
133C:												
Dalbo	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
133E:												
Dalbo	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
137:												
Dovray	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Poor.
141B:												
Egeland	Fair	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Good.
141C:												
Egeland	Very poor.	Fair	Good	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Good.
168B:												
Forman	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
168C2:												
Forman	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
168D2:												
Forman	Poor	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
168E:												
Forman	Very poor.	Very poor.	Good	Good	Good	Fair	Very poor.	Very poor.	Very poor.	Good	Very poor.	Fair.
171B:												
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor	---
180:												
Gonvick	Good	Good	Good	Good	Fair	---	Poor	Poor	Good	Good	Poor	---
184:												
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor	Fair.
191:												
Epoufette	Fair	Fair	Poor	Poor	Poor	---	Good	Good	Fair	Poor	Good	---
202:												
Meehan	Poor	Fair	Good	Fair	Fair	---	Fair	Fair	Fair	Fair	Fair	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
207D:												
Nymore	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---
267B:												
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
267C:												
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
267E:												
Snellman	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
315A:												
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
315B:												
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
332B:												
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
335:												
Urness	Fair	Fair	Fair	Poor	Very poor.	Poor	Good	Good	Fair	Poor	Poor	---
339:												
Fordville	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Very poor.	Good	Very poor.	Very poor.	Good.
344:												
Quam	Fair	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good	Poor.
351:												
Colvin	Fair	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good	Fair.
375:												
Forada	Good	Good	Fair	Fair	Fair	---	Good	Good	Good	Fair	Good	---
398:												
Winger	Fair	Fair	Fair	Poor	Poor	Fair	Good	Good	Fair	Poor	Good	---
406A:												
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
406B:												
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
413:												
Osakis	Fair	Fair	Fair	Poor	Poor	---	Poor	Poor	Fair	Poor	Poor	---
418:												
Lamoure	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
422B:												
Bygland	Good	Good	Good	Fair	---	Fair	Poor	Poor	Good	Poor	Poor	---
422C:												
Bygland	Good	Good	Good	Fair	---	Fair	Poor	Poor	Good	Poor	Poor	---
503B:												
Balmlake	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
503C:												
Balmlake	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
503E:												
Balmlake	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
508:												
Wyndmere	Fair	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor	Fair.
540:												
Seelyeville	Very poor.	Fair	Good	Poor	Poor	---	Good	Good	Fair	Poor	Good	---
541:												
Rifle	Fair	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
544:												
Cathro	Poor	Fair	Fair	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
564:												
Friendship	Poor	Fair	Good	Fair	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---
567A:												
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
567B:												
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
579C2:												
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor	---
Langhei	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.	---
624:												
Rosy	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
701:												
Runeberg	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
711B:												
Arvilla	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Poor.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
711B:												
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.	---
711C:												
Arvilla	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Poor.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.	---
718B:												
Naytahwaush	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
718C:												
Naytahwaush	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
718E:												
Naytahwaush	Very poor.	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
721E:												
Corliss	Very poor.	Very poor.	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
746:												
Haslie	Poor	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
747B:												
Audubon	Good	Good	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
753D:												
Abbeylake	Poor	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
753E:												
Abbeylake	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
765:												
Smiley	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	---	Good	Fair.
767:												
Auganaush	Poor	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Fair	Fair	---
775B:												
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Two Inlets	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
775C:												
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
776B:												
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
776C:												
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
776E:												
Snellman	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Sugarbush	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
778B:												
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Corliss	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
778C:												
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Corliss	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
780B:												
Audubon	Good	Good	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
Boyerlake	Fair	Good	Fair	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
780C2:												
Audubon	Good	Good	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
Boyerlake	Fair	Good	Fair	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
780D2:												
Audubon	Fair	Good	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Poor	Very poor.	---
Boyerlake	Fair	Fair	Fair	Poor	Poor	---	Very poor.	Very poor.	Fair	Poor	Very poor.	---
785:												
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.
Winger	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
786:												
Winger	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.
Colvin	Fair	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good	Fair.
797:												
Mooselake	Very poor.	Poor	Poor	Poor	Fair	---	Good	Good	Poor	Poor	Good	---
Lupton	Fair	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
867B:												
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
Menahga	Poor	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
867C:												
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
Menahga	Poor	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
867E:												
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
Menahga	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
903B:												
Barnes	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Langhei	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.	Fair.
903C2:												
Barnes	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
Langhei	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
931C2:												
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor	---
Langhei	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
942D2:												
Langhei	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Barnes	Poor	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
943D2:												
Langhei	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Formdale	Fair	Good	Good	Good	Fair	---	Poor	Poor	Good	Fair	Poor	---
943E:												
Langhei	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Formdale	Poor	Fair	Good	Good	Fair	---	Very poor.	Very poor.	Good	Fair	Very poor.	---
951B:												
Nebish	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
951C:												
Nebish	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
951E:												
Nebish	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Sugarbush	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1015:												
Udipsamments.												
1016:												
Udorthents	Poor	Poor	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
1027:												
Udorthents.												
1030:												
Pits.												
Udipsamments.												
1104B:												
Waukon	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1104C:												
Waukon	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1111:												
Nidaros	Very poor.	Very poor.	Poor	Poor	Poor	---	Good	Good	Very poor.	Poor	Good	---
1113:												
Haslie	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---	Good	Good	Poor	Very poor.	Good	---
Seelyeville	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
Cathro	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
1125B:												
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Poor	---
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1125C:												
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1126B:												
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
Nymore	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
1127A:												
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
1127B:												
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
1128:												
Cathro	Poor	Fair	Fair	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
1129:												
Lindaas	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	---
1130:												
Wolverton	Good	Good	Good	Fair	Poor	Poor	Poor	Poor	Good	Fair	Poor	---
1131B:												
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1131B:												
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1132B:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Balmlake	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1132C:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Balmlake	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1132E:												
Eagleview	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Balmlake	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1135:												
Foxlake	Good	Good	Good	Poor	Poor	---	Good	Good	Good	Poor	Good	---
1136:												
Nidaros	Very poor.	Very poor.	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
1137B:												
Birchlake	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1137C:												
Birchlake	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
1137D:												
Birchlake	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
1137E:												
Birchlake	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
1138:												
Rushlake	Poor	Good	Good	Good	Good	---	Fair	Poor	Good	Good	Fair	---
Hangaard	Poor	Fair	Fair	Fair	Poor	---	Good	Good	Fair	Fair	Good	---
1140B:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1140C:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
1149:												
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.
1195B:												
Sybil	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1195C:												
Sybil	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1195E:												
Sybil	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Eagleview	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
1196B:												
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Two Inlets	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1196C:												
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
1196E:												
Lida	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
1200:												
Egglake	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	---
1201C:												
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1201E:												
Sugarbush	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Snellman	Very poor.	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1210:												
Paddock	Fair	Good	Good	Good	Good	---	Fair	Fair	Fair	Good	Fair	---
Epoufette	Fair	Fair	Poor	Poor	Poor	---	Good	Good	Fair	Poor	Good	---
1211:												
Egglake	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	---
Cathro	Poor	Fair	Fair	Fair	Fair	---	Good	Good	Poor	Fair	Good	---
1225:												
Wykeham	Good	Good	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor	---
Karlstad	Poor	Fair	Fair	Fair	Fair	---	Poor	Very poor.	Poor	Fair	Very poor.	---
1227:												
Quam	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	Very poor.
Cathro	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
Urness	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	---
1230:												
Haslie	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---	Good	Good	Poor	Very poor.	Good	---
Nidaros	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
1234B:												
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor	---
Buse	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.	Fair.
1235B:												
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor	---
Buse	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.	Fair.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.	---
1236B:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1236C:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1236E:												
Eagleview	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
1238E:												
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Sugarbush	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1242D:												
Sandberg	Very poor.	Fair	Good	Poor	Poor	---	Very poor.	Very poor.	Fair	Poor	Very poor.	---
Arvilla	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Poor.
1243B:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1243C:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1243E:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1244B:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Sugarbush	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
1244C:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Sugarbush	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
1244E:												
Sol	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Sugarbush	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
1246:												
Winger	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
1247D:												
Corliss	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Dorset	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1248C:												
Nymore	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
1249C:												
Graycalm	Poor	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	---
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1250C:												
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Verndale	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
1251:												
Lamoure	Very poor.	Poor	Fair	Good	Good	Fair	Fair	Fair	Poor	Good	Fair	Fair.
1252B:												
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
1263C:												
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Bootlake	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1291:												
Sedgeville	Very poor.	Poor	Poor	Fair	Fair	---	Good	Good	Poor	Fair	Good	---
1306:												
Karlstad	Poor	Fair	Fair	Fair	Fair	---	Poor	Very poor.	Poor	Fair	Very poor.	---
1317:												
Vallers	Fair	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.
1318:												
Darnen	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
1319B:												
Rockwood	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1319C:												
Rockwood	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---

WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1319D:												
Rockwood	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
1320B:												
Blowers	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
1321:												
Paddock	Fair	Good	Good	Good	Good	---	Fair	Fair	Fair	Good	Fair	---
1365:												
Hillview	Fair	Good	Good	Good	Good	---	Fair	Fair	Fair	Good	Fair	---
1825B:												
Seelyeville	Poor	Poor	Poor	Poor	Poor	---	Good	Fair	Poor	Poor	Fair	---
1878:												
Hamre	Fair	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good	Poor.
1938:												
Lakepark	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Fair.
1942:												
Forada	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Poor.
1967:												
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.
Vallers	Fair	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.
1975:												
Oylen	Good	Good	Good	Good	Good	---	Fair	Fair	Good	Good	Fair	---
1997:												
Vallers	Fair	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair	Fair.
Winger	Fair	Fair	Fair	Poor	Poor	Fair	Good	Good	Fair	Poor	Good	---

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The

ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to

minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of groundwater pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

BUILDING SITE DEVELOPMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
20B:						
Chapett	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
20C2:						
Chapett	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
20E:						
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
26:						
Aazdahl	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
33B:						
Barnes	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
36:						
Flom	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
38B:						
Waukon	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
38C:						
Waukon	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
38E:						
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
40B:						
Nebish	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
40C:						
Nebish	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
40E:						
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
47:						
Colvin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
63:						
Rockwell	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
108:						
McIntosh	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
111:						
Hangaard	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
121:						
Wykeham	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
125:						
Beltrami	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
133A:						
Dalbo	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
133B:						
Dalbo	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
133C:						
Dalbo	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
133E:						
Dalbo	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
137:						
Dovray	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
141B:						
Egeland	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
141C:						
Egeland	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
168B:						
Forman	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
168C2:						
Forman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
168D2:						
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
168E:						
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
171B:						
Formdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
180:						
Gonvick	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
184:						
Hamerly	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
191:						
Epoufette	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
202:						
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid.
207D:						
Nymore	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
267B:						
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
267C:						
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
267E:						
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
315A:						
Bootlake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
315B:						
Bootlake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
332B:						
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
335:						
Urness	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
339:						
Fordville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
344:						
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
351:						
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
375:						
Forada	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
398:						
Winger	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
406A:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
406B:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
413:						
Osakis	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
418:						
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
422B:						
Bygland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
422C:						
Bygland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Moderate: wetness, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
503B:						
Balmlake	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
503C:						
Balmlake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
503E:						
Balmlake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
508:						
Wyndmere	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
540:						
Seelyeville	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
541:						
Rifle	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.
544:						
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
564:						
Friendship	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
567A:						
Verndale	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
567B:						
Verndale	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
579C2:						
Formdale	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Sandberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty.
624:						
Rosy	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
701:						
Runeberg	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
711B:						
Arvilla	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
711C:						
Arvilla	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Sandberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty.
718B:						
Naytahwaush	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
718C:						
Naytahwaush	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
718E:						
Naytahwaush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
721E:						
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
746:						
Haslie	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
747B:						
Audubon	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
753D:						
Abbeylake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
753E:						
Abbeylake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
765:						
Smiley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
767:						
Auganaush	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
775B:						
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Two Inlets	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
775C:						
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Two Inlets	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty, slope.
776B:						
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
776C:						
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
776C:						
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
776E:						
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
778B:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Corliss	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
778C:						
Dorset	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Corliss	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
780B:						
Audubon	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Boyerlake	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
780C2:						
Audubon	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
Boyerlake	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
780D2:						
Audubon	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Boyerlake	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
785:						
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
Winger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
786:						
Winger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
797:						
Mooselake	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Lupton	Severe: excess humus, wetness.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness, frost action.	Severe: wetness, excess humus.
867B:						
Graycalm	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
Menahga	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
867C:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Menahga	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
867E:						
Graycalm	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Menahga	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
903B:						
Barnes	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
Langhei	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
903C2:						
Barnes	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
931C2:						
Formdale	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
942D2:						
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
943D2:						
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
943E:						
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
951B:						
Nebish	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
951C:						
Nebish	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
951E:						
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1015:						
Udipsamments	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty, too sandy.
1016:						
Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1027:						
Udorthents.						
1030:						
Pits.						
Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1104B:						
Waukon	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
Dorset	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1104C:						
Waukon	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Dorset	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1111:						
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, ponding, flooding.	Severe: ponding, flooding, excess humus.
1113:						
Haslie	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Seelyeville	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1113:						
Cathro----------	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
1125B:						
Sverdrup--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Abbeylake-------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
1125C:						
Sverdrup--------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Abbeylake-------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
1126B:						
Verndale--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Nymore----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
1127A:						
Bootlake--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Graycalm--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
1127B:						
Bootlake--------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Graycalm--------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: droughty.
1128:						
Cathro----------	Severe: cutbanks cave, excess humus, ponding.				Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1129:						
Lindaas---------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
1130:						
Wolverton-------	Severe: cutbanks cave.	Slight---------	Moderate: wetness, shrink-swell.	Slight---------	Moderate: frost action.	Slight.
1131B:						
Verndale--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1131B:						
Abbeylake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
1132B:						
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Balmlake	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
1132C:						
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Balmlake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
1132E:						
Eagleview	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Balmlake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1135:						
Foxlake	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
1136:						
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1137B:						
Birchlake	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
1137C:						
Birchlake	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1137D:						
Birchlake	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
1137E:						
Birchlake	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1138:						
Rushlake	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Severe: droughty.
Hangaard	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
1140B:						
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
1140C:						
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
1149:						
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
1195B:						
Sybil	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1195C:						
Sybil	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1195E:						
Sybil	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Eagleview	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1196B:						
Lida	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1196B:						
Two Inlets	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
1196C:						
Lida	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Two Inlets	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty, slope.
1196E:						
Lida	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Two Inlets	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1200:						
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1201C:						
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
1201E:						
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1210:						
Paddock	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.
Epoufette	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1211:						
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1211:						
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1225:						
Wykeham	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
Karlstad	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
1227:						
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Cathro	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Urness	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
1230:						
Haslie	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1234B:						
Formdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
1235B:						
Formdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Sandberg	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1236B:						
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1236C:						
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1236E:						
Eagleview	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1238E:						
Two Inlets	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1242D:						
Sandberg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Arvilla	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1243B:						
Sol	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
1243C:						
Sol	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
1243E:						
Sol	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1244B:						
Sol	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1244C:						
Sol	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1244C:						
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1244E:						
Sol	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1246:						
Winger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
1247D:						
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Dorset	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1248C:						
Nymore	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Verndale	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1249C:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Bootlake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1250C:						
Abbeylake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Verndale	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1251:						
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
1252B:						
Bootlake	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1263C:						
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Bootlake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1291:						
Sedgeville	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
1306:						
Karlstad	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
1317:						
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1318:						
Darnen	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: frost action.	Slight.
1319B:						
Rockwood	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
1319C:						
Rockwood	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
1319D:						
Rockwood	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1320B:						
Blowers	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: large stones.
1321:						
Paddock	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.
1365:						
Hillview	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1825B:						
Seelyeville	Severe: excess humus, wetness.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness.	Severe: subsides, wetness, frost action.	Severe: wetness, excess humus.

BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1878:						
Hamre	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
1938:						
Lakepark	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1942:						
Forada	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1967:						
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1975:						
Oylen	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: droughty.
1997:						
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
Winger	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

SANITARY FACILITIES

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
20B:					
Chapett	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
20C2:					
Chapett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
20E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
26:					
Aazdahl	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
33B:					
Barnes	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
36:					
Flom	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
38B:					
Waukon	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
38C:					
Waukon	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
38E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
40B:					
Nebish	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
40C:					
Nebish	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
40E:					
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
47:					
Colvin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
63:					
Rockwell	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
108:					
McIntosh	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
111:					
Hangaard	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
121:					
Wykeham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
125:					
Beltrami	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
133A:					
Dalbo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
133B:					
Dalbo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
133C:					
Dalbo	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
133E:					
Dalbo	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
137:					
Dovray	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
141B:					
Egeland	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
141C:					
Egeland	Moderate: slope.	Severe: seepage, slope.	Moderate: slope, too sandy.	Severe: seepage.	Poor: seepage.
168B:					
Forman	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
168C2:					
Forman	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
168D2:					
Forman	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
168E:					
Forman	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
171B:					
Formdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
180:					
Gonvick	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
184:					
Hamerly	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
191:					
Epoufette	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
202:					
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
207D:					
Nymore	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
267B:					
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
267C:					
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
267E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
315A:					
Bootlake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
315B:					
Bootlake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
332B:					
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
335:					
Urness	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
339:					
Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
344:					
Quam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
351:					
Colvin	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
375:					
Forada	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
398:					
Winger	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
406A:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
406B:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
413:					
Osakis	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
418:					
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
422B:					
Bygland	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
422C:					
Bygland	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
503B:					
Balmlake	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too sandy.	Slight	Poor: too sandy.
503C:					
Balmlake	Moderate: percs slowly, slope.	Severe: slope.	Severe: too sandy.	Moderate: slope.	Poor: too sandy.
503E:					
Balmlake	Severe: slope.	Severe: slope.	Severe: slope, too sandy.	Severe: slope.	Poor: too sandy, slope.
508:					
Wyndmere	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy.
540:					
Seelyeville	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
541:					
Rifle	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
544:					
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
564:					
Friendship	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
567A:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
567B:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
579C2:					
Formdale	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Langhei	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Sandberg	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
624:					
Rosy	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
701:					
Runeberg	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
711B:					
Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sandberg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
711C:					
Arvilla	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
711C:					
Sandberg	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
718B:					
Naytahwaush	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
718C:					
Naytahwaush	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
718E:					
Naytahwaush	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
721E:					
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
746:					
Haslie	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: hard to pack, ponding.
747B:					
Audubon	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
753D:					
Abbeylake	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
753E:					
Abbeylake	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
765:					
Smiley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
767:					
Auganaush	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
775B:					
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
775C:					
Sugarbush	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
776B:					
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
776C:					
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Sugarbush	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
776E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
778B:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Corliss	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
778C:					
Dorset	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Corliss	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
780B:					
Audubon	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Boyerlake	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
780C2:					
Audubon	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Boyerlake	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
780D2:					
Audubon	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Boyerlake	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
785:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Winger	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
786:					
Winger	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Colvin	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
797:					
Mooselake	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Lupton	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: wetness, excess humus.
867B:					
Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Menahga	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
867C:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Menahga	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
867E:					
Graycalm	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Menahga	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
903B:					
Barnes	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Langhei	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
903C2:					
Barnes	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Langhei	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
931C2:					
Formdale	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
931C2:					
Langhei	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
942D2:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
943D2:					
Langhei	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Formdale	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
943E:					
Langhei	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Formdale	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
951B:					
Nebish	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
951C:					
Nebish	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Sugarbush	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
951E:					
Nebish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1015:					
Udipsamments----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1016:					
Udorthents------	Slight----------	Slight----------	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
1027:					
Udorthents.					
1030:					
Pits.					
Udipsamments----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1104B:					
Waukon----------	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
Dorset----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1104C:					
Waukon----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Dorset----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1111:					
Nidaros---------	Severe: subsides, flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
1113:					
Haslie----------	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, too clayey, excess humus.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Seelyeville-----	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Cathro----------	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1125B:					
Sverdrup	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Abbeylake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1125C:					
Sverdrup	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Abbeylake	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1126B:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Nymore	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1127A:					
Bootlake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1127B:					
Bootlake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1128:					
Cathro	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, ponding.
1129:					
Lindaas	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1130:					
Wolverton	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1131B:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Abbeylake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1132B:					
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Balmlake	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too sandy.	Slight	Poor: too sandy.
1132C:					
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Balmlake	Moderate: percs slowly, slope.	Severe: slope.	Severe: too sandy.	Moderate: slope.	Poor: too sandy.
1132E:					
Eagleview	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Balmlake	Severe: slope.	Severe: slope.	Severe: slope, too sandy.	Severe: slope.	Poor: too sandy, slope.
1135:					
Foxlake	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1136:					
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
1137B:					
Birchlake	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: hard to pack.
1137C:					
Birchlake	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Poor: hard to pack.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1137D:					
Birchlake	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
1137E:					
Birchlake	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
1138:					
Rushlake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Hangaard	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
1140B:					
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
1140C:					
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
1149:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1195B:					
Sybil	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1195C:					
Sybil	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1195C:					
Eagleview-------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1195E:					
Sybil----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Eagleview-------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1196B:					
Lida----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1196C:					
Lida----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1196E:					
Lida----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Two Inlets------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1200:					
Egglake---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1201C:					
Sugarbush-------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Snellman--------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1201E:					
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1210:					
Paddock	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Epoufette	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1211:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
1225:					
Wykeham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Karlstad	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1227:					
Quam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Urness	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1230:					
Haslie	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, too clayey, excess humus.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1234B:					
Formdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
1235B:					
Formdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Sandberg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1236B:					
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1236C:					
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1236E:					
Eagleview	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1238E:					
Two Inlets	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1242D:					
Sandberg	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Arvilla	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1243B:					
Sol	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Fair: small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1243C:					
Sol	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
1243E:					
Sol	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.
1244B:					
Sol	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Fair: small stones.
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1244C:					
Sol	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Sugarbush	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1244E:					
Sol	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1246:					
Winger	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1247D:					
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Dorset	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1248C:					
Nymore	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1248C:					
Verndale	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1249C:					
Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Bootlake	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1250C:					
Abbeylake	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Verndale	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1251:					
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
1252B:					
Bootlake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1263C:					
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Bootlake	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1291:					
Sedgeville	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
1306:					
Karlstad	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1317:					
Vallers	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1318:					
Darnen	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
1319B:					
Rockwood	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
1319C:					
Rockwood	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
1319D:					
Rockwood	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1320B:					
Blowers	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Moderate: wetness, too sandy.	Moderate: wetness.	Fair: too sandy, small stones, wetness.
1321:					
Paddock	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1365:					
Hillview	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
1825B:					
Seelyeville	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: wetness, excess humus.
1878:					
Hamre	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1938:					
Lakepark	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1942:					
Forada	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1967:					
Hamerly---------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Vallers---------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1975:					
Oylen----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
1997:					
Vallers---------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hamerly---------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Winger----------	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

CONSTRUCTION MATERIALS

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
20B:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
20C2:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
20E:				
Chapett	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
26:				
Aazdahl	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
33B:				
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
36:				
Flom	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
38B:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
38C:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
38E:				
Waukon	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
40B:				
Nebish	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
40C:				
Nebish	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
40E:				
Nebish	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
47:				
Colvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
63:				
Rockwell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
108:				
McIntosh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
111:				
Hangaard	Poor: wetness.	Probable	Improbable: excess fines.	Poor: too sandy, small stones, wetness.
121:				
Wykeham	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
125:				
Beltrami	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
133A:				
Dalbo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
133B:				
Dalbo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
133C:				
Dalbo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
133E:				
Dalbo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
137:				
Dovray	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
141B:				
Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
141C:				
Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones, slope.
168B:				
Forman	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
168C2:				
Forman	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
168D2:				
Forman	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
168E:				
Forman	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
171B:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
180:				
Gonvick	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
184:				
Hamerly	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
191:				
Epoufette	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
202:				
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
207D:				
Nymore	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
267B:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
267C:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
267E:				
Snellman	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
315A:				
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
315B:				
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
332B:				
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
335:				
Urness	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
339:				
Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
344:				
Quam	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
351:				
Colvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
375:				
Forada	Fair: wetness.	Probable	Probable	Poor: small stones.
398:				
Winger	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
406A:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
406B:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
413:				
Osakis	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
418:				
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
422B:				
Bygland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
422C:				
Bygland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
503B:				
Balmlake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
503C:				
Balmlake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
503E:				
Balmlake	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
508:				
Wyndmere	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
540:				
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
541:				
Rifle	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
544:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
564:				
Friendship	Good	Probable	Improbable: too sandy.	Poor: too sandy.
567A:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
567B:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
579C2:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Langhei	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
579C2:				
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
624:				
Rosy	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
701:				
Runeberg	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
711B:				
Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
711C:				
Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
718B:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
718C:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
718E:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
721E:				
Corliss	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
746:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
747B:				
Audubon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
753D:				
Abbeylake	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
753E:				
Abbeylake	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
765:				
Smiley	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
767:				
Auganaush	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
775B:				
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Two Inlets	Good	Probable	Probable	Poor: small stones, area reclaim.
775C:				
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Two Inlets	Good	Probable	Probable	Poor: small stones, area reclaim.
776B:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
776C:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
776E:				
Snellman	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
776E:				
Sugarbush	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
778B:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Corliss	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
778C:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Corliss	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
780B:				
Audubon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Boyerlake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
780C2:				
Audubon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Boyerlake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
780D2:				
Audubon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Boyerlake	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
785:				
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Winger	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
786:				
Winger	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Colvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
797:				
Mooselake	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Lupton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
867B:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Menahga	Good	Probable	Improbable: too sandy.	Poor: too sandy.
867C:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Menahga	Good	Probable	Improbable: too sandy.	Poor: too sandy.
867E:				
Graycalm	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, slope.
Menahga	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
903B:				
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Langhei	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
903C2:				
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
903C2:				
Langhei	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
931C2:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Langhei	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
942D2:				
Langhei	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Barnes	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
943D2:				
Langhei	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
943E:				
Langhei	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Formdale	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
951B:				
Nebish	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
951C:				
Nebish	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
951E:				
Nebish	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sugarbush	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1015:				
Udipsamments	Good	Probable	Probable	Poor: too sandy.
1016:				
Udorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
1027:				
Udorthents.				
1030:				
Pits.				
Udipsamments	Poor: slope.	Probable	Probable	Poor: too sandy, slope.
1104B:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1104C:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1111:				
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1113:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1113:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1125B:				
Sverdrup	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1125C:				
Sverdrup	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1126B:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Nymore	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1127A:				
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
1127B:				
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
1128:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
1129:				
Lindaas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1130:				
Wolverton	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
1131B:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1132B:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Balmlake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1132C:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Balmlake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1132E:				
Eagleview	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Balmlake	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
1135:				
Foxlake	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1136:				
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1137B:				
Birchlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1137C:				
Birchlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1137D:				
Birchlake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
1137E:				
Birchlake	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
1138:				
Rushlake	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Hangaard	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, wetness.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1140B:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1140C:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1149:				
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1195B:				
Sybil	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1195C:				
Sybil	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1195E:				
Sybil	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Eagleview	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
1196B:				
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
Two Inlets	Good	Probable	Probable	Poor: small stones, area reclaim.
1196C:				
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
Two Inlets	Good	Probable	Probable	Poor: small stones, area reclaim.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1196E:				
Lida	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Two Inlets	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
1200:				
Egglake	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1201C:				
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1201E:				
Sugarbush	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Snellman	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
1210:				
Paddock	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Epoufette	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1211:				
Egglake	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1225:				
Wykeham	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Karlstad	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1227:				
Quam	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1227:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Urness	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1230:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1234B:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1235B:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
1236B:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1236C:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1236E:				
Eagleview	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
1238E:				
Two Inlets	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Sugarbush	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1242D:				
Sandberg	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Arvilla	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1243B:				
Sol	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1243C:				
Sol	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1243E:				
Sol	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
1244B:				
Sol	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1244C:				
Sol	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1244E:				
Sol	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sugarbush	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1246:				
Winger	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1247D:				
Corliss	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1247D:				
Dorset	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1248C:				
Nymore	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1249C:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1250C:				
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1251:				
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1252B:				
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1263C:				
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Bootlake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1291:				
Sedgeville	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
1306:				
Karlstad	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1317:				
Vallers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1318:				
Darnen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1319B:				
Rockwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
1319C:				
Rockwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
1319D:				
Rockwood	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1320B:				
Blowers	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1321:				
Paddock	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1365:				
Hillview	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1825B:				
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
1878:				
Hamre	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1938:				
Lakepark	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1942:				
Forada	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
1967:				
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Vallers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1975:				
Oylen	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1997:				
Vallers---------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Hamerly---------	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Winger----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

WATER MANAGEMENT

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
20B:							
Chapett	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
20C2:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
20E:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
26:							
Aazdahl	Slight	Moderate: wetness.	Severe: slow refill.	Deep to water	Favorable	Erodes easily	Erodes easily.
33B:							
Barnes	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
36:							
Flom	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
38B:							
Waukon	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
38C:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
38E:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
40B:							
Nebish	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
40C: Nebish	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
40E: Nebish	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
47: Colvin	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
63: Rockwell	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
108: McIntosh	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
111: Hangaard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty.
121: Wykeham	Moderate: seepage.	Moderate: wetness.	Severe: cutbanks cave.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
125: Beltrami	Moderate: seepage.	Severe: piping.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	Wetness	Favorable.
133A: Dalbo	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Erodes easily, wetness.	Erodes easily, percs slowly.
133B: Dalbo	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, percs slowly.
133C: Dalbo	Severe: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
133E:							
Dalbo	Severe: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
137:							
Dovray	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
141B:							
Egeland	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
141C:							
Egeland	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
168B:							
Forman	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
168C2:							
Forman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
168D2:							
Forman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
168E:							
Forman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
171B:							
Formdale	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
180:							
Gonvick	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Wetness	Favorable.
184:							
Hamerly	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
191: Epoufette	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
202: Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
207D: Nymore	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
267B: Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
267C: Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
267E: Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
315A: Bootlake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty	Too sandy, soil blowing.	Droughty.
315B: Bootlake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
332B: Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
335: Urness	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
339:							
Fordville	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Rooting depth	Too sandy	Rooting depth.
344:							
Quam	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
351:							
Colvin	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
375:							
Forada	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Wetness.
398:							
Winger	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
406A:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
406B:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
413:							
Osakis	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
418:							
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
422B:							
Bygland	Moderate: slope.	Moderate: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
422C: Bygland	Severe: slope.	Moderate: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
503B: Balmlake	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Erodes easily, too sandy.	Erodes easily.
503C: Balmlake	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily, too sandy.	Slope, erodes easily.
503E: Balmlake	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily, too sandy.	Slope, erodes easily.
508: Wyndmere	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Favorable.
540: Seelyeville	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
541: Rifle	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
544: Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
564: Friendship	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
567A:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
567B:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
579C2:							
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
624:							
Rosy	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
701:							
Runeberg	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, rooting depth, percs slowly.
711B:							
Arvilla	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
711C:							
Arvilla	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
718B: Naytahwaush	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
718C: Naytahwaush	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
718E: Naytahwaush	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
721E: Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
746: Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
747B: Audubon	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
753D: Abbeylake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
753E: Abbeylake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
765: Smiley	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
767: Auganaush	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
775B:							
Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
Two Inlets	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
775C:							
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
776B:							
Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
776C:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
776E:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
778B:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
778B:							
Corliss	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
778C:							
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
780B:							
Audubon	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Boyerlake	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, percs slowly.
780C2:							
Audubon	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Boyerlake	Severe: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
780D2:							
Audubon	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Boyerlake	Severe: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
785:							
Hamerly	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Winger	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
786:							
Winger	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
Hamerly	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Colvin	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
797:							
Mooselake	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, subsides.	Ponding	Ponding	Wetness.
Lupton	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Subsides, frost action.	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
867B:							
Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Menahga	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
867C:							
Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Menahga	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
867E:							
Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Menahga	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
903B:							
Barnes	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Langhei	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
903C2:							
Barnes	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
931C2:							
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
942D2:							
Langhei	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Barnes	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
943D2:							
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
943E:							
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
951B:							
Nebish	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
951B:							
Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
951C:							
Nebish	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
951E:							
Nebish	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1015:							
Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1016:							
Udorthents	Slight	Slight	Severe: no water.	Deep to water	Slope	Slope	Slope.
1027:							
Udorthents.							
1030:							
Pits.							
Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1104B:							
Waukon	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1104C:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1111:							
Nidaros	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, subsides.	Ponding, soil blowing, rooting depth.	Ponding, soil blowing.	Wetness, rooting depth.
1113:							
Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Seelyeville	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1125B:							
Sverdrup	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Abbeylake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1125C:							
Sverdrup	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Abbeylake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1126B:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1126B:							
Nymore	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1127A:							
Bootlake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty	Too sandy, soil blowing.	Droughty.
Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1127B:							
Bootlake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1128:							
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
1129:							
Lindaas	Slight	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness	Wetness, percs slowly.
1130:							
Wolverton	Severe: seepage.	Moderate: piping, wetness.	Severe: slow refill, cutbanks cave.	Favorable	Wetness	Wetness, soil blowing.	Favorable.
1131B:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Abbeylake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1132B:							
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Balmlake	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Erodes easily, too sandy.	Erodes easily.
1132C:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Balmlake	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily, too sandy.	Slope, erodes easily.
1132E:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Balmlake	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily, too sandy.	Slope, erodes easily.
1135:							
Foxlake	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1136:							
Nidaros	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
1137B:							
Birchlake	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
1137C:							
Birchlake	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1137D:							
Birchlake	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
1137E:							
Birchlake	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
1138:							
Rushlake	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Hangaard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty.
1140B:							
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
1140C:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
1149:							
Hamerly	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
1195B:							
Sybil	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1195C:							
Sybil	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1195E:							
Sybil	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1196B:							
Lida	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Two Inlets	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
1196C:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1196E:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1200:							
Egglake	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness, rooting depth.	Wetness	Wetness, rooting depth.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1201C:							
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
1201E:							
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
1210:							
Paddock	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Wetness, soil blowing, percs slowly.	Wetness, soil blowing.	Wetness, rooting depth.
Epoufette	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
1211:							
Egglake	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness, soil blowing, rooting depth.	Wetness, soil blowing.	Wetness, rooting depth.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
1225:							
Wykeham	Moderate: seepage.	Moderate: wetness.	Severe: cutbanks cave.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
Karlstad	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Large stones, wetness, too sandy.	Large stones, droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1227:							
Quam	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Urness	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1230:							
Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Nidaros	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
1234B:							
Formdale	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
1235B:							
Formdale	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
1236B:							
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1236C:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1236E:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1238E:							
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1242D:							
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Arvilla	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1243B:							
Sol	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.
1243C:							
Sol	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
1243E:							
Sol	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
1244B:							
Sol	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.
Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
1244C:							
Sol	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1244C:							
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1244E:							
Sol	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1246:							
Winger	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
1247D:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1248C:							
Nymore	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Verndale	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1249C:							
Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Bootlake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1250C:							
Abbeylake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Verndale	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1251:							
Lamoure	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
1252B:							
Bootlake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1263C:							
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Bootlake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
1291:							
Sedgeville	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding, too sandy.	Wetness.
1306:							
Karlstad	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Large stones, wetness, too sandy.	Large stones, droughty.
1317:							
Vallers	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1318: Darnen	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
1319B: Rockwood	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Soil blowing	Rooting depth.
1319C: Rockwood	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, soil blowing.	Slope, rooting depth.
1319D: Rockwood	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, soil blowing.	Slope, rooting depth.
1320B: Blowers	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Frost action, slope, cutbanks cave.	Slope, wetness, soil blowing.	Wetness, too sandy, soil blowing.	Rooting depth.
1321: Paddock	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Wetness, soil blowing, percs slowly.	Wetness, soil blowing.	Wetness, rooting depth.
1365: Hillview	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
1825B: Seelyeville	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Subsides, frost action, slope.	Slope, wetness.	Wetness	Wetness.
1878: Hamre	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
1938: Lakepark	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.

WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1942:							
Forada	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding	Ponding, too sandy.	Wetness.
1967:							
Hamerly	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Vallers	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
1975:							
Oylen	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
1997:							
Vallers	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Hamerly	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Winger	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of the Soils," the estimated content

of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. These soils are moderately erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

In the table "Chemical Properties of the Soils," *cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. It is a measurement of the nutrient-holding capacity of the soil.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate is expressed as a weighted percentage of the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients, such as phosphorus, is affected by the amount of carbonates in the soil.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil. A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the

water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table "Soil Features" shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

ENGINEERING INDEX PROPERTIES

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
20B:												
Chapett---------	0-8	Fine sandy loam	SM, SC	A-4, A-2-4	0-1	0-5	95-100	85-95	50-80	30-50	15-20	2-10
	8-23	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	23-33	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	33-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
20C2:												
Chapett---------	0-9	Fine sandy loam	SM, SC	A-4, A-2-4	0-1	0-5	95-100	85-95	50-80	30-50	15-20	2-10
	9-26	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	26-43	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	43-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
20E:												
Chapett---------	0-7	Fine sandy loam	SM, SC	A-4, A-2-4	0-1	0-5	95-100	85-95	50-80	30-50	15-20	2-10
	7-20	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	20-33	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	33-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
26:												
Aazdahl---------	0-13	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	13-19	Clay loam, silty clay loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	19-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
33B:												
Barnes----------	0-7	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	7-13	Loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	13-60	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
36:												
Flom----------	0-16	Silty clay loam	CL	A-7, A-6	0	0	95-100	95-100	90-100	80-95	35-50	15-30
	16-24	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0	95-100	95-100	90-100	70-95	30-50	10-30
	24-60	Loam, clay loam	CL	A-6, A-7	0	0	95-100	90-100	80-95	60-90	20-50	10-30
38B:												
Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-20	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	20-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
38C:												
Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-20	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	20-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
38E:												
Waukon----------	0-7	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	7-26	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	26-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
40B:												
Nebish----------	0-7	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	7-26	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	26-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
40C:												
Nebish----------	0-8	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	8-26	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	26-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
40E:												
Nebish----------	0-9	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	9-22	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	22-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
47:												
Colvin----------	0-10	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-50	15-30
	10-26	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	26-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	70-95	25-50	10-25
63:												
Rockwell--------	0-18	Loam----------	OL, ML	A-4	0	0	100	95-100	85-95	50-75	20-40	NP-10
	18-25	Fine sandy loam, sandy loam, loam.	SM, ML, SC-SM, CL-ML	A-4	0	0	100	95-100	60-85	35-55	15-25	1-7
	25-32	Fine sand, sand, loamy fine sand.	SM	A-2	0	0	100	95-100	65-80	20-35	0-14	NP
	32-60	Silt loam, loam, clay loam.	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-1	95-100	90-100	70-90	40-85	15-40	5-20
108:												
McIntosh--------	0-9	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	85-100	70-95	28-36	9-15
	9-30	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	28-43	9-21
	30-60	Loam, clay loam	CL, ML	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	28-43	9-21
111:												
Hangaard--------	0-10	Sandy loam-----	SM, SM-SC	A-2	0	0	95-100	92-100	50-75	15-35	---	NP
	10-18	Loamy sand, coarse sandy loam, loamy coarse sand.	SP-SM, SM	A-2	0	0	95-100	92-100	50-75	10-30	---	NP
	18-60	Gravelly coarse sand, gravelly sand, coarse sand.	SM, SP	A-3, A-1, A-2	0	0	85-100	80-100	35-70	2-15	15-20	NP
121:												
Wykeham---------	0-8	Fine sandy loam	SM, SC-SM	A-4	0	0-5	90-100	85-100	65-80	40-50	25-30	2-5
	8-11	Fine sandy loam, loamy sand, sandy loam.	SM, SC-SM	A-4, A-2	0	0-5	85-100	70-95	65-80	25-50	15-20	1-5
	11-21	Loam, sandy clay loam, sandy loam.	SC, CL	A-6	0	0-5	90-100	85-95	70-80	35-60	30-35	10-15
	21-60	Fine sandy loam, sandy loam.	SC-SM, SC	A-4	0	0-5	85-95	85-95	65-80	35-50	20-25	5-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
125:												
Beltrami	0-4	Loam	ML, CL, CL-ML	A-4	0-1	0-3	95-100	85-95	75-95	50-65	20-30	3-10
	4-8	Fine sandy loam, loam, loamy sand.	SM, SC-SM, ML, CL-ML	A-4, A-2	0-1	0-3	95-100	85-95	60-90	25-60	15-25	NP-7
	8-22	Loam, sandy clay loam, clay loam.	CL	A-6, A-7	0-1	0-3	95-100	85-98	75-95	50-85	20-45	10-30
	22-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-1	1-3	95-100	85-95	70-95	50-80	20-40	5-20
133A:												
Dalbo	0-6	Silt loam	CL, ML, CL-ML	A-4	0	0	100	100	95-100	60-100	20-35	2-10
	6-41	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	85-100	40-65	20-40
	41-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	0	100	95-100	95-100	85-100	30-60	10-35
133B:												
Dalbo	0-7	Silt loam	CL, ML, CL-ML	A-4	0	0	100	100	95-100	60-100	20-35	2-10
	7-21	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	85-100	40-65	20-40
	21-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	0	100	95-100	95-100	85-100	30-60	10-35
133C:												
Dalbo	0-7	Silt loam	CL, ML, CL-ML	A-4	0	0	100	100	95-100	60-100	20-35	2-10
	7-25	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	85-100	40-65	20-40
	25-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	0	100	95-100	95-100	85-100	30-60	10-35
133E:												
Dalbo	0-7	Silt loam	CL, ML, CL-ML	A-4	0	0	100	100	95-100	60-100	20-35	2-10
	7-29	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	85-100	40-65	20-40
	29-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	0	100	95-100	95-100	85-100	30-60	10-35
137:												
Dovray	0-10	Silty clay	CH, MH, OH	A-7	0	0	100	100	95-100	85-95	56-76	33-49
	10-43	Clay, silty clay.	CH, MH	A-7	0	0	100	100	95-100	85-95	56-76	33-49
	43-54	Clay, silty clay.	CH, MH	A-7	0	0	100	100	90-100	85-95	56-76	33-49
	54-60	Clay, silty clay loam, clay loam.	CH, MH, CL	A-7	0	0	100	100	80-100	70-95	41-76	21-49

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
141B:												
Egeland---------	0-9	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	9-16	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	16-60	Stratified fine sand to silt loam.	SM, ML, SC-SM	A-2, A-4	0	0	95-100	85-100	65-90	30-80	15-25	NP-5
141C:												
Egeland---------	0-13	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	13-22	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	22-60	Stratified fine sand to silt loam.	SM, ML, SC-SM	A-2, A-4	0	0	95-100	85-100	65-90	30-80	15-25	NP-5
168B:												
Forman----------	0-8	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	8-15	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168C2:												
Forman----------	0-7	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	7-16	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	16-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168D2:												
Forman----------	0-8	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	8-15	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
168E:												
Forman----------	0-7	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	7-15	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	15-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
171B:												
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-14	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	14-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
180:												
Gonvick---------	0-12	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	85-95	50-75	20-40	3-20
	12-34	Loam, clay loam	CL	A-6, A-7	0	0-3	95-100	90-100	75-95	50-85	20-50	10-30
	34-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	70-95	50-80	15-40	5-20
184:												
Hamerly---------	0-10	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	10-24	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	85-95	80-95	60-75	20-40	5-20
	24-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	85-95	80-95	60-75	20-40	5-20
191:												
Epoufette-------	0-6	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-5	95-100	65-95	60-75	25-40	15-25	NP-7
	6-12	Loamy sand, sand, gravelly loamy sand.	SM, SP, SP-SM	A-2, A-3	0	0-5	95-100	65-95	50-75	0-30	---	NP.
	12-20	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SC, SC-SM	A-2, A-4	0	0-5	95-100	70-95	60-80	25-40	15-25	2-10
	20-60	Gravelly sand, coarse sand, sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0	0-10	50-90	45-85	30-60	0-10	---	NP
202:												
Meehan----------	0-13	Loamy sand-----	SM	A-2, A-1	0	0	90-100	75-100	40-90	15-30	0-14	NP
	13-25	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	0-14	NP
	25-60	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	0-14	NP
207D:												
Nymore----------	0-6	Loamy sand-----	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	50-75	5-30	15-20	NP
	6-46	Sand, coarse sand, loamy coarse sand.	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	85-100	45-75	2-15	15-20	NP
	46-60	Sand, coarse sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	0	95-100	85-100	45-75	2-15	15-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
267B:												
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-16	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	16-31	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	31-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
267C:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-16	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	16-28	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	28-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
267E:												
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-14	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	14-28	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	28-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
315A:												
Bootlake--------	0-6	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	6-13	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	13-28	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	28-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
315B:												
Bootlake--------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	3-9	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	9-21	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	21-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
332B:												
Sugarbush-------	0-4	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	4-13	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	13-18	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	18-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
335:												
Urness----------	0-7	Mucky silt loam	OL, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	20-50	3-20
	7-60	Mucky silt loam, mucky silty clay loam, silty clay loam.	ML, CL, CL-ML, OL	A-4, A-6, A-7	0	0	95-100	90-100	85-100	70-95	20-50	3-30
339:												
Fordville-------	0-10	Loam----------	ML, CL	A-4, A-6, A-7	0	0	100	100	70-85	55-75	30-45	5-20
	10-17	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	95-100	70-95	55-80	30-45	5-20
	17-28	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	95-100	90-100	65-90	40-55	25-40	3-15
	28-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SM, SW-SM	A-1	0	0	55-85	50-75	30-55	2-10	15-25	NP-5

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
344:												
Quam----------	0-10	Silty clay loam	CL, ML, OL	A-7	0	0	100	100	90-100	85-95	40-50	15-25
	10-42	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	0	100	100	80-100	70-95	30-50	5-25
	42-60	Clay loam, silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	0	100	90-100	85-95	70-90	20-50	5-20
351:												
Colvin----------	0-12	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-50	15-30
	12-45	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	45-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	70-95	25-50	10-25
375:												
Forada----------	0-14	Loam----------	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	5-20
	14-22	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	15-30	NP-10
	22-60	Sand, gravelly coarse sand, loamy sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-100	50-100	40-70	5-30	---	NP
398:												
Winger----------	0-13	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	13-37	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	2-15
	37-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-100	75-95	50-75	20-45	3-25
406A:												
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-21	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	21-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
406B:												
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-17	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	17-29	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	29-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
413:												
Osakis----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	95-100	85-100	50-70	25-40	15-25	NP-7
	8-18	Loam, sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	0	95-100	85-100	55-90	25-70	20-35	1-8
	18-60	Coarse sand, gravelly coarse sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	55-85	50-75	30-55	2-10	15-20	NP
418:												
Lamoure---------	0-39	Silty clay loam	CL, CH, MH, ML	A-7	0	0	100	100	95-100	85-100	40-70	15-35
	39-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	0	95-100	95-100	70-95	35-90	30-70	10-35
422B:												
Bygland---------	0-8	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	8-22	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	22-38	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	38-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
422C:												
Bygland---------	0-8	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	8-16	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	16-25	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	25-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
503B:												
Balmlake--------	0-3	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	3-20	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	20-28	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	28-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
503C:												
Balmlake--------	0-2	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	2-17	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	17-29	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	29-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
503E:												
Balmlake--------	0-2	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	2-15	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	15-28	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	28-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
508:												
Wyndmere--------	0-14	Fine sandy loam	SM, ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-80	30-55	10-30	NP-10
	14-24	Sandy loam, fine sandy loam.	SM, ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-90	30-55	10-30	NP-10
	24-60	Fine sand, loamy fine sand, fine sandy loam.	SM, ML	A-2, A-4	0	0	100	100	60-100	20-55	---	NP
540:												
Seelyeville-----	0-24	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	24-60	Muck, mucky peat.	PT	A-8	0	0	0	0	0	0	---	NP
541:												
Rifle----------	0-14	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
	14-60	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
544:												
Cathro----------	0-8	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	8-22	Sapric material	PT	A-8	0	0	0	0	0	0	---	NP
	22-60	Sandy loam, loam, clay loam.	CL-ML, SC-SM, SC, CL	A-4, A-6	0	0-5	85-100	75-100	60-100	35-90	20-40	5-20
564:												
Friendship------	0-3	Loamy sand-----	SM, SP-SM	A-1, A-2	0	0	75-100	75-100	40-75	12-30	0-14	NP
	3-31	Sand, coarse sand.	SP-SM, SM, SP	A-1, A-3, A-2	0	0	75-100	75-100	40-70	3-15	0-14	NP
	31-60	Sand, coarse sand.	SP-SM, SM, SP	A-1, A-3, A-2	0	0	75-100	75-100	40-70	3-15	0-14	NP
567A:												
Verndale--------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	8-15	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	15-33	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	33-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
567B:												
Verndale--------	0-7	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	7-13	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	13-31	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	31-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
579C2:												
Formdale--------	0-7	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	7-11	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	11-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Langhei---------	0-7	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	7-13	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	13-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
Sandberg--------	0-8	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-18	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	18-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
624:												
Rosy----------	0-20	Sandy loam-----	ML, SM, CL-ML, SC-SM	A-4	0	0	100	95-100	70-95	40-65	15-25	NP-6
	20-26	Loam, very fine sandy loam, fine sandy loam.	ML, SM, SC, CL	A-4, A-6	0	0	100	95-100	70-95	40-75	20-40	3-15
	26-60	Stratified sand to silty clay loam.	SM, SC, ML, CL	A-4, A-2-4	0	0	95-100	95-100	60-95	30-75	15-30	2-8
701:												
Runeberg--------	0-10	Mucky loam-----	ML, CL	A-4, A-6	0-1	2-5	95-100	90-95	80-90	50-80	30-40	5-15
	10-36	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0-1	5-10	85-95	80-95	60-75	30-45	15-25	3-10
	36-60	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0-1	5-10	85-95	80-95	60-75	30-45	15-25	3-8
711B:												
Arvilla---------	0-8	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-15	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	15-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GP, SM, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
711B:												
Sandberg--------	0-8	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-15	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	15-36	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	36-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
711C:												
Arvilla---------	0-8	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-15	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	15-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GP, SM, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
Sandberg--------	0-8	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-15	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	15-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
718B:												
Naytahwaush-----	0-4	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	4-7	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	7-30	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	30-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
718C:												
Naytahwaush-----	0-4	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	4-6	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	6-23	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	23-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
718E:												
Naytahwaush-----	0-3	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	3-7	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	7-23	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	23-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
721E:												
Corliss---------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
746:												
Haslie----------	0-8	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	8-43	Sapric material, muck.	PT	A-8	0	0	0	0	0	0	---	NP
	43-60	Coprogenous earth, mucky silt loam.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
747B:												
Audubon---------	0-9	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	9-29	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	29-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
753D:												
Abbeylake-------	0-8	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	8-24	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	24-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
753E:												
Abbeylake-------	0-3	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	3-21	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	21-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
765:												
Smiley----------	0-13	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-2	95-100	85-100	75-95	50-80	15-35	2-12
	13-26	Clay loam, loam, silty clay loam.	CL, ML	A-6, A-7	0-1	0-2	95-100	85-100	70-95	50-80	25-50	10-25
	26-47	Loam, fine sandy loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0-1	0-2	95-100	85-100	70-95	40-80	25-40	6-18
	47-60	Loam, fine sandy loam, clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0-1	0-2	95-100	85-100	70-95	40-80	25-40	6-18
767:												
Auganaush-------	0-5	Loam----------	CL, ML, CL-ML	A-4, A-6	0	0-5	95-100	85-95	85-95	60-90	20-40	5-15
	5-8	Loam, fine sandy loam, silt loam.	SM, CL-ML, SC-SM	A-4	0	0-5	95-100	85-95	75-90	40-70	15-30	NP-10
	8-22	Clay, clay loam, silty clay loam.	CL, CH, MH	A-7	0	0-5	95-100	85-95	85-95	70-90	45-70	25-45
	22-60	Clay loam, silty clay loam, silty clay.	CL, ML, CH	A-6, A-7	0	0-5	95-100	85-95	80-95	60-90	35-55	15-30
775B:												
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-13	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	13-25	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	25-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
Two Inlets------	0-4	Loamy sand-----	SM	A-2-4	0	0-2	80-100	50-90	35-70	15-30	---	NP
	4-13	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	13-27	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	27-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
775C:												
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-10	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	10-22	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	22-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
Two Inlets------	0-2	Loamy sand-----	SM	A-2-4	0	0-2	80-100	50-90	35-70	15-30	---	NP
	2-10	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	10-27	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	27-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP
776B:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-12	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	12-32	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	32-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-17	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	17-28	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	28-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
776C:												
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-16	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	16-32	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	32-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-14	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	14-21	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	21-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
776E:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-14	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	14-26	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	26-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-10	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	10-19	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	19-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
778B:												
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-20	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	20-24	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	24-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Corliss---------	0-5	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	5-13	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-3, A-2-4	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	13-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
778C:												
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-15	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	15-18	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	18-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Corliss---------	0-5	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	5-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
780B:												
Audubon---------	0-9	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	9-27	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	27-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
780B:												
Boyerlake-------	0-9	Clay loam------	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	70-80	51-66	29-39
	9-17	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
	17-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
780C2:												
Audubon---------	0-10	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	10-20	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	20-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
Boyerlake-------	0-9	Clay loam------	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	70-80	51-66	29-39
	9-19	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
	19-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
780D2:												
Audubon---------	0-10	Silty clay loam	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	10-22	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
	22-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	95-100	94-99	90-99	70-94	43-66	21-39
Boyerlake-------	0-7	Clay loam------	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	70-80	51-66	29-39
	7-37	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
	37-60	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0-1	0-2	96-100	93-99	85-97	80-90	51-66	29-39
785:												
Hamerly---------	0-8	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	8-33	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	33-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
785:												
Winger----------	0-15	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	15-22	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	20-40	2-15
	22-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-97	75-95	50-75	20-45	3-25
786:												
Winger----------	0-14	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	14-33	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	20-40	2-15
	33-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-97	75-95	50-75	20-45	3-25
Hamerly---------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	9-18	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	18-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Colvin----------	0-15	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-50	15-30
	15-38	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	38-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	70-95	25-50	10-25
797:												
Mooselake-------	0-15	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
	15-60	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
Lupton----------	0-15	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	15-60	Sapric material	PT	A-8	0	0	0	0	0	0	---	NP
867B:												
Graycalm--------	0-6	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	6-21	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	21-46	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
	46-60	Sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
867B:												
Menahga---------	0-3	Loamy sand-----	SM, SP-SM	A-2	0	0	100	85-100	60-80	10-30	---	NP
	3-42	Coarse sand, sand, loamy coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
	42-60	Coarse sand, sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
867C:												
Graycalm--------	0-6	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	6-26	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	26-55	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
	55-60	Sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	---	NP
Menahga---------	0-2	Loamy sand-----	SM, SP-SM	A-2	0	0	100	85-100	60-80	10-30	---	NP
	2-40	Coarse sand, sand, loamy coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
	40-60	Coarse sand, sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
867E:												
Graycalm--------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	3-37	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	37-60	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
Menahga---------	0-12	Loamy sand-----	SM, SP-SM	A-2	0	0	100	85-100	60-80	10-30	---	NP
	12-52	Coarse sand, sand, loamy coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
	52-60	Coarse sand, sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	80-100	30-75	0-10	---	NP
903B:												
Barnes----------	0-9	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	9-19	Loam, sandy clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	19-60	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
903B:												
Langhei---------	0-6	Loam----------	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	75-90	55-80	20-40	5-20
	6-17	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
	17-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
903C2:												
Barnes----------	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	8-19	Loam, sandy clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	19-60	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Langhei---------	0-7	Loam----------	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	75-90	55-80	20-40	5-20
	7-16	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
	16-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
931C2:												
Formdale--------	0-7	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	7-15	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	15-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Langhei---------	0-8	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	8-19	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	19-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
942D2:												
Langhei---------	0-7	Loam----------	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	75-90	55-80	20-40	5-20
	7-11	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
	11-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
Barnes----------	0-7	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	7-15	Loam, sandy clay loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	15-60	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
943D2:												
Langhei---------	0-6	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	6-13	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	13-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
Formdale--------	0-7	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	7-14	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	14-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
943E:												
Langhei---------	0-8	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	8-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-16	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	16-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
951B:												
Nebish----------	0-2	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	2-7	Clay loam, loam	SM, SC-SM	A-4, A-2-4	0	0-3	95-100	85-100	50-85	30-50	15-25	NP-6
	7-26	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	26-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-9	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	9-17	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	17-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
951C:												
Nebish----------	0-3	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	3-11	Clay loam, loam	SM, SC-SM	A-4, A-2-4	0	0-3	95-100	85-100	50-85	30-50	15-25	NP-6
	11-26	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	26-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-9	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	9-15	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	15-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
951E:												
Nebish----------	0-3	Loam----------	ML, CL-ML	A-4	0	0-3	95-100	85-100	85-95	50-70	20-40	1-10
	3-11	Clay loam, loam	SM, SC-SM	A-4, A-2-4	0	0-3	95-100	85-100	50-85	30-50	15-25	NP-6
	11-27	Loam, clay loam, sandy clay loam.	CL, ML	A-6, A-7	0	0-3	95-100	85-100	70-95	55-80	30-50	10-20
	27-60	Loam, clay loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-95	50-80	20-40	5-20
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-8	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	8-16	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	16-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
1015:												
Udipsamments----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP
1016:												
Udorthents------	0-60	Variable-------	---	---	---	---	---	---	---	---	---	---
	60-80	Variable-------	---	---	0	0	0	0	0	0	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1027: Udorthents.												
1030: Pits.												
Udipsamments----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP
1104B: Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-17	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	17-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	8-14	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	14-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1104C: Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-21	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	21-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-7	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	7-16	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	16-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1111: Nidaros----------	0-24	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	24-38	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	38-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
1113: Haslie----------	0-20	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	20-60	Coprogenous earth, mucky silty clay.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1113:												
Seelyeville-----	0-18	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	18-60	Mucky peat, muck.	PT	A-8	0	0	0	0	0	0	---	NP
Cathro----------	0-23	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	23-60	Sandy loam, silt loam, clay loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
1125B:												
Sverdrup--------	0-10	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	20-30	NP-10
	10-25	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	25-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	93-100	50-90	2-10	15-20	NP-5
Abbeylake-------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	9-28	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	28-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
1125C:												
Sverdrup--------	0-10	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	20-30	NP-10
	10-41	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	41-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	93-100	50-90	2-10	15-20	NP-5
Abbeylake-------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	9-26	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	26-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
1126B:												
Verndale--------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	8-15	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	15-47	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	47-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
Nymore----------	0-7	Loamy sand-----	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	50-75	5-30	15-20	NP
	7-41	Sand, coarse sand, loamy coarse sand.	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	85-100	45-75	2-15	15-20	NP
	41-60	Sand, coarse sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	0	95-100	85-100	45-75	2-15	15-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1127A:												
Bootlake--------	0-7	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	7-13	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	13-18	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	18-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
Graycalm--------	0-7	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	7-22	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	22-56	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
	56-60	Sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	---	NP
1127B:												
Bootlake--------	0-6	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	6-10	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	10-16	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	16-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
Graycalm--------	0-6	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	6-37	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	37-60	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
1128:												
Cathro----------	0-8	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	8-22	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	22-60	Stratified silty clay loam to sand.	ML, CL, CL-ML	A-4, A-6	0	0-1	95-100	90-100	75-95	50-90	15-40	2-20
1129:												
Lindaas---------	0-14	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-48	21-25
	14-29	Clay, silty clay.	CL, CH	A-7	0	0	100	100	95-100	85-95	51-76	29-49
	29-60	Silt loam, silty clay loam.	CL-ML	A-6	0	0	100	100	95-100	85-95	41-48	21-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1130:												
Wolverton-------	0-8	Fine sandy loam	CL-ML, SC-SM, CL	A-4, A-6	0	0	100	100	90-100	40-90	15-30	4-11
	8-12	Loamy very fine sand, loamy fine sand, loamy sand.	SM, SC-SM	A-2-4, A-4	0	0	100	100	85-100	30-50	15-25	NP-7
	12-41	Loamy very fine sand, loamy fine sand, fine sand.	SM, SC-SM, SP-SM	A-2-4, A-4	0	0-3	100	90-100	75-90	10-50	15-21	NP-4
	41-60	Clay loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	1-10	95-100	90-100	50-90	50-80	28-43	9-21
1131B:												
Verndale--------	0-12	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	12-16	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	16-35	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	35-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
Abbeylake-------	0-7	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	7-22	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	22-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
1132B:												
Eagleview-------	0-9	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	9-28	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	28-48	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	48-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1132B:												
Balmlake--------	0-7	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	7-17	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	17-24	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	24-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
1132C:												
Eagleview-------	0-7	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	7-23	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	23-37	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	37-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
Balmlake--------	0-3	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	3-22	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	22-29	Fine sandy loam, sandy loam, loam.	SM, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	29-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
1132E:												
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-15	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	15-46	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	46-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1132E:												
Balmlake--------	0-3	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-85	30-50	15-25	2-10
	3-17	Very fine sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-25	NP-4
	17-27	Fine sandy loam, sandy loam, loam.	SM, CL, CL, SC, ML	A-4	0	0	100	95-100	60-90	35-65	20-30	2-10
	27-60	Stratified fine sand to silt loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	95-100	65-90	30-80	15-25	NP-5
1135:												
Foxlake---------	0-19	Silty clay loam	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	19-38	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	38-49	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
	49-60	Silty clay loam, silty clay, clay loam.	CL, MH	A-7	0-1	0-2	95-100	95-99	85-95	70-90	43-66	21-39
1136:												
Nidaros---------	0-31	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	31-49	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	49-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
1137B:												
Birchlake-------	0-8	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	8-27	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	27-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1137C:												
Birchlake-------	0-8	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	8-17	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	17-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1137D:												
Birchlake-------	0-7	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	7-15	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	15-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1137E:												
Birchlake-------	0-7	Silty clay loam	CL, MH	A-7	0-1	0-2	96-100	94-99	85-95	70-90	39-48	18-25
	7-16	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-1	0-2	96-100	94-99	85-95	75-90	43-66	21-39
	16-60	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
	40-80	Silty clay loam, clay loam.	CL, CH	A-7, A-6	0-1	0-2	96-100	94-99	85-95	70-90	35-57	18-32
1138:												
Rushlake--------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	75-100	15-60	10-35	---	NP
	7-60	Gravelly sand, gravelly loamy sand, sand.	SP, SP-SM	A-1-b, A-3	0	0-3	55-95	50-90	15-60	2-10	---	NP
Hangaard--------	0-13	Sandy loam-----	SM	A-2, A-4	0	0-3	95-100	80-100	50-75	20-45	---	NP
	13-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP-SM, SP	A-3, A-1, A-2	0	2-5	70-95	55-90	30-60	0-10	---	NP
1140B:												
Eagleview-------	0-9	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	9-22	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	22-40	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	40-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1140B:												
Snellman--------	0-7	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	7-18	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	18-34	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	34-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
1140C:												
Eagleview-------	0-10	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	10-30	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	30-49	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	49-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-11	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	11-21	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	21-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
1149:												
Hamerly---------	0-10	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	10-26	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	26-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1195B:												
Sybil----------	0-5	Loamy sand-----	SM, SP-SM	A-1-b, A-4, A-2-4	0	0	95-100	90-100	35-100	5-45	15-20	NP-4
	5-10	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	10-15	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	15-32	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-3, A-2-4	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	32-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-7	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	7-19	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	19-33	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	33-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1195C:												
Sybil----------	0-8	Loamy sand-----	SM, SP-SM	A-1-b, A-4, A-2-4	0	0	95-100	90-100	35-100	5-45	15-20	NP-4
	8-17	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	17-26	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	26-37	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-3, A-2-4	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	37-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-4	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	4-15	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	15-28	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	28-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1195E:												
Sybil----------	0-4	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0	95-100	90-100	50-90	15-55	15-30	NP-9
	4-15	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-3, A-2-4	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	15-19	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	19-25	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-3, A-2-4	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	25-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-5	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	5-22	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	22-39	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	39-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1196B:												
Lida----------	0-9	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	9-13	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	13-25	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	25-45	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1-b, A-4, A-2-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	45-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-1-b, A-3, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1196B:												
Two Inlets------	0-7	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	7-14	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	14-29	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	29-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP
1196C:												
Lida----------	0-8	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	8-17	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	17-25	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	25-41	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1-b, A-4, A-2-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	41-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-1-b, A-3, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets------	0-4	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	4-9	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	9-38	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	38-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1196E:												
Lida----------	0-3	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	3-14	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	14-20	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	20-27	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1-b, A-4, A-2-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	27-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-1-b, A-3, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets------	0-3	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	3-7	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	7-21	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	21-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP
1200:												
Egglake---------	0-4	Loam----------	ML, CL-ML	A-4	0-1	0-5	95-100	85-98	50-97	50-90	15-25	3-7
	4-9	Fine sandy loam, sandy loam, loam.	SM	A-2-4	0-1	0-5	95-100	85-98	40-50	25-35	15-21	2-4
	9-20	Sandy clay loam, sandy loam, loam.	SC, CL	A-6, A-4	0-1	0-5	95-100	85-98	55-75	40-60	28-36	9-15
	20-60	Sandy loam, coarse sandy loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4	0-1	0-5	95-100	85-98	50-70	35-55	21-28	4-9

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1201C:												
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-14	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	14-24	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	24-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-14	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	14-29	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	29-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
1201E:												
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-11	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	11-15	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	15-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-15	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	15-28	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	28-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	41-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1210:												
Paddock---------	0-9	Sandy loam-----	SM, SC-SM	A-2, A-4	0	2-10	85-100	80-100	60-80	25-40	0-25	1-7
	9-16	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0-10	85-95	85-90	60-75	25-40	0-20	1-5
	16-29	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	0-10	85-95	80-95	60-75	25-45	0-25	2-10
	29-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	0-10	85-90	80-90	60-75	25-40	0-20	2-8
Epoufette-------	0-8	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-5	95-100	65-95	60-75	25-40	15-25	NP-7
	8-17	Loamy sand, sand, gravelly loamy sand.	SM, SP, SP-SM	A-2, A-3	0	0-5	95-100	65-95	50-75	0-30	---	NP
	17-25	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SC, SC-SM	A-2, A-4	0	0-5	95-100	70-95	60-80	25-40	15-25	2-10
	25-60	Gravelly sand, coarse sand, sand.	SP, GP, SP-SM, GP-GM	A-1, A-3, A-2-4	0	0-10	50-90	45-85	30-60	0-10	---	NP
1211:												
Egglake---------	0-4	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0-1	0-5	95-100	85-98	45-55	30-40	15-25	3-7
	4-9	Fine sandy loam, sandy loam, loam.	SM	A-2-4	0-1	0-5	95-100	85-98	40-50	25-35	15-21	2-4
	9-25	Sandy clay loam, sandy loam, loam.	SC, CL	A-6, A-4	0-1	0-5	95-100	85-98	55-75	40-60	28-36	9-15
	25-60	Sandy loam, coarse sandy loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4	0-1	0-5	95-100	85-98	50-70	35-55	21-28	4-9
Cathro----------	0-17	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	17-60	Sandy loam, loam, clay loam.	CL-ML, SC-SM, SC, CL	A-4, A-6	0	0-5	85-100	75-100	60-100	35-90	20-40	5-20
1225:												
Wykeham---------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-5	90-100	85-100	65-80	40-50	25-30	2-5
	8-16	Fine sandy loam, loamy sand, sandy loam.	SM, SC-SM	A-4, A-2	0	0-5	85-100	70-95	65-80	25-50	15-20	1-5
	16-37	Loam, sandy clay loam, sandy loam.	SC, CL	A-6	0	0-5	90-100	85-95	70-80	35-60	30-35	10-15
	37-60	Fine sandy loam, sandy loam.	SC-SM, SC	A-4	0	0-5	85-95	85-95	65-80	35-50	20-25	5-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1225:												
Karlstad--------	0-12	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0-5	0-5	95-100	95-100	75-95	12-50	15-25	NP-10
	12-18	Coarse sandy loam, sandy loam, fine sandy loam.	SM, SC, SC-SM	A-2, A-4	0-5	0-5	95-100	95-100	75-95	12-50	15-25	NP-10
	18-29	Gravelly coarse sandy loam, gravelly sandy loam, gravelly fine sandy loam.	SC, SM, SC-SM, SP-SM	A-2, A-1, A-3	0-5	0-25	65-95	50-75	25-50	10-30	15-25	NP-10
	29-60	Stratified gravelly coarse sand to loamy fine sand.	SP, SP-SM	A-1, A-2, A-3	0-5	0-25	60-100	35-100	20-80	10-55	---	NP
1227:												
Quam----------	0-33	Silt loam------	OL, ML	A-7, A-4, A-6, A-5	0	0	100	100	80-100	70-95	30-50	5-20
	33-50	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	0	100	100	80-100	70-95	30-50	5-25
	50-60	Clay loam, silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	0	100	90-100	85-95	70-90	20-50	5-20
Cathro----------	0-24	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	24-60	Sandy loam, silt loam, clay loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
Urness----------	0-20	Mucky silt loam	OL, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	20-50	3-20
	20-45	Mucky silt loam, mucky silty clay loam, silty clay loam.	ML, CL, CL-ML, OL	A-4, A-6, A-7	0	0	95-100	90-100	85-100	70-95	20-50	3-30
	45-60	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7	0	0-2	95-100	85-100	75-100	65-95	35-50	11-20
1230:												
Haslie----------	0-18	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	18-60	Coprogenous earth, mucky silty clay.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
Nidaros---------	0-38	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	38-54	Coarse sandy loam, sandy clay loam, loam.	SC-SM, SC, CL, CL-ML	A-6, A-4, A-2-6	0	0	95-100	85-100	45-95	25-70	21-40	NP-20
	54-60	Coarse sand, sand, gravelly coarse sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-15	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1234B:												
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-15	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	15-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Buse----------	0-7	Clay loam------	CL, ML	A-6, A-7	0	0-5	90-100	85-95	70-95	55-90	35-45	10-20
	7-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	5-20
1235B:												
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-11	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	11-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Buse----------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-95	70-95	55-90	20-35	3-15
	8-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6, A-7	0	0-5	90-100	85-100	70-90	55-85	25-45	5-20
Sandberg--------	0-8	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-12	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	12-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
1236B:												
Eagleview-------	0-2	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	2-11	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	11-48	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	48-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1236C:												
Eagleview-------	0-7	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	7-23	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	23-37	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	37-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1236E:												
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-16	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	16-40	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	40-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1238E:												
Two Inlets------	0-2	Loamy sand-----	SM	A-2-4	0	0-2	80-100	50-90	35-70	15-30	---	NP
	2-10	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	10-33	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	33-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-12	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	12-18	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	18-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1242D:												
Sandberg--------	0-7	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	7-19	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	19-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
Arvilla---------	0-7	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	7-17	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	17-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GP, SM, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
1243B:												
Sol----------	0-3	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	3-17	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	17-30	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	30-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10
1243C:												
Sol----------	0-2	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	2-18	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	18-30	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	30-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10
1243E:												
Sol----------	0-3	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	3-18	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	18-36	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	36-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1244B:												
Sol----------	0-2	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	2-21	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	21-30	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	30-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-13	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	13-21	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	21-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
1244C:												
Sol----------	0-2	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	2-22	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	22-31	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	31-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	2-18	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	18-38	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	38-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
1244E:												
Sol----------	0-3	Sandy loam-----	SM, SC, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	50-80	25-40	15-25	2-8
	3-23	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4, A-4	0	0-15	95-100	75-95	45-80	20-40	15-20	NP-7
	23-30	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-1	95-100	75-95	70-90	40-70	25-40	8-18
	30-60	Fine sandy loam, sandy loam.	SM, SC, CL, ML	A-2-4, A-4	0	0-1	95-100	75-95	60-85	35-55	15-25	2-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1244E:												
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	80-100	55-70	25-35	15-20	NP-4
	3-17	Loamy sand, loamy coarse sand, sand.	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	80-100	40-70	10-25	---	NP
	17-47	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	80-100	50-70	25-35	15-20	NP-4
	47-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0-5	0-5	55-85	50-85	30-55	2-10	---	NP
1246:												
Winger----------	0-15	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	15-37	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	20-40	2-15
	37-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-97	75-95	50-75	20-45	3-25
1247D:												
Corliss---------	0-9	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	9-16	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-3, A-2-4	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	16-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-17	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	17-25	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	25-60	Gravelly coarse sand, gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1248C:												
Nymore----------	0-7	Loamy sand-----	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	50-75	5-30	15-20	NP
	7-55	Sand, coarse sand, loamy coarse sand.	SM, SP, SP-SM	A-1, A-2, A-3	0	0	95-100	85-100	45-75	2-15	15-20	NP
	55-60	Sand, coarse sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	0	95-100	85-100	45-75	2-15	15-20	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1248C:												
Verndale--------	0-6	Coarse sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	6-27	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	27-48	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	48-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
1249C:												
Graycalm--------	0-8	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0-5	95-100	75-100	35-75	10-30	---	NP
	8-18	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	---	NP
	18-37	Sand, loamy sand, loamy coarse sand.	SM, SP, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	---	NP
	37-60	Sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	---	NP
Bootlake--------	0-8	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	8-17	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	17-27	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	27-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
1250C:												
Abbeylake--------	0-9	Loamy coarse sand.	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	9-16	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	16-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
Verndale--------	0-8	Coarse sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	8-14	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	14-28	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	28-60	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1251:												
Lamoure---------	0-41	Silt loam------	CL, ML	A-6, A-7	0	0	100	100	95-100	85-100	35-50	10-25
	41-53	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	0	100	100	90-100	60-100	40-70	15-35
	53-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	0	95-100	95-100	70-95	35-90	30-70	10-35
1252B:												
Bootlake--------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	3-14	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	14-41	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	41-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP
Eagleview-------	0-2	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	2-12	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	12-42	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	42-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1263C:												
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-17	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	17-32	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	32-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
Bootlake--------	0-3	Sandy loam-----	SM	A-2-4	0	0	95-100	90-100	55-70	25-35	0-20	NP-4
	3-15	Coarse sand, loamy coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-1-b	0	0	95-100	90-100	40-70	10-25	0-14	NP
	15-24	Sandy loam, coarse sandy loam.	SM	A-2-4	0	0	95-100	90-100	50-65	25-35	0-20	NP-4
	24-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2-4	0	0	95-100	75-100	50-80	2-10	0-14	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1291:												
Sedgeville------	0-8	Loam----------	CL, SC, CL-ML, SC-SM	A-4, A-6	0	0-5	80-100	75-100	65-100	45-85	20-35	4-15
	8-34	Silt loam, sandy loam, coarse sandy loam.	SM, SC, CL, SC-SM	A-2-4, A-4, A-1	0	0-5	80-100	75-100	35-100	20-90	15-30	3-10
	34-60	Sand, coarse sand, gravelly loamy coarse sand.	SP, SM, GP, SP-SM	A-1	0	0-5	80-100	50-100	15-25	1-20	---	NP
1306:												
Karlstad--------	0-15	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0-5	0-5	95-100	95-100	75-95	12-50	15-25	NP-10
	15-27	Coarse sandy loam, sandy loam, fine sandy loam.	SM, SC, SC-SM	A-2, A-4	0-5	0-5	95-100	95-100	75-95	12-50	15-25	NP-10
	27-60	Stratified gravelly coarse sand to loamy fine sand.	SP, SP-SM	A-1, A-2, A-3	0-5	0-25	60-100	35-100	20-80	10-55	---	NP
1317:												
Vallers---------	0-15	Silty clay loam	OL, CL, ML	A-6, A-7	0	0	95-100	95-100	95-100	85-95	30-50	11-20
	15-23	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	0	95-100	90-100	80-95	50-80	30-40	11-20
	23-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	60-85	20-40	5-20
1318:												
Darnen----------	0-56	Loam----------	ML, CL, CL-ML	A-4	0	0	100	100	85-100	60-90	20-35	2-10
	56-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	85-100	60-90	20-45	5-25
1319B:												
Rockwood--------	0-4	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	4-14	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	14-19	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	19-30	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	30-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1319C:												
Rockwood--------	0-7	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	7-16	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	16-23	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	23-31	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	31-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10
1319D:												
Rockwood--------	0-2	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	2-15	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	15-21	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	21-32	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	32-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10
1320B:												
Blowers---------	0-3	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-10	85-100	85-100	60-80	30-40	20-30	1-7
	3-14	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-10	85-95	85-90	60-75	30-40	0-20	1-5
	14-22	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	0-10	85-95	85-95	60-75	30-40	0-25	2-10
	22-32	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	0-10	85-95	80-95	60-75	30-40	0-25	2-10
	32-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	0-10	85-95	80-90	60-75	25-40	0-25	2-10
1321:												
Paddock---------	0-4	Fine sandy loam	SM, SC-SM	A-2, A-4	0	2-10	85-100	80-100	60-80	25-40	0-25	1-7
	4-16	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0-10	85-95	85-90	60-75	25-40	0-20	1-5
	16-43	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0	0-10	85-95	80-95	60-75	25-45	0-25	2-10
	43-60	Sandy loam, loamy sand.	SM, SC, SC-SM	A-2, A-4	0	0-10	85-90	80-90	60-75	25-40	0-20	2-8
1365:												
Hillview--------	0-8	Fine sandy loam	SM, SC, SC-SM	A-2, A-4, A-2-4	0	0	98-100	93-100	60-85	30-50	15-25	2-10
	8-19	Sandy loam, loamy fine sand, loamy sand.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-2-4	0	0	98-100	93-100	45-85	20-60	10-20	NP-7
	19-28	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-2, A-4, A-2-4	0	0	98-100	93-100	60-90	35-65	15-30	2-12
	28-60	Stratified very fine sandy loam to fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4, A-2-4	0	0	98-100	93-100	60-90	20-70	10-20	NP-7

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1825B:												
Seelyeville-----	0-60	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
1878:												
Hamre----------	0-14	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	14-19	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0-1	0-3	90-100	80-100	70-100	50-90	25-45	6-20
	19-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0-1	0-3	80-100	75-100	65-95	50-85	25-45	6-20
1938:												
Lakepark--------	0-8	Clay loam------	CL	A-6	0	0	100	92-100	90-100	65-90	30-40	10-15
	8-28	Clay loam, silty clay loam, silt loam.	ML, CL	A-4, A-6	0	0	100	92-100	90-100	65-90	30-40	2-12
	28-34	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-98	85-100	65-90	30-45	15-30
	34-60	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	75-85	55-75	30-40	10-20
1942:												
Forada----------	0-10	Mucky loam-----	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	NP-10
	10-21	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	20-40	NP-10
	21-60	Sand, coarse sand, gravelly coarse sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-90	50-80	40-70	2-30	0-14	NP
1967:												
Hamerly---------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	9-20	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	20-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Vallers---------	0-15	Silty clay loam	OL, CL, ML	A-6, A-7	0	0	95-100	95-100	95-100	85-95	30-50	11-20
	15-25	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	0	95-100	90-100	80-95	50-80	30-40	11-20
	25-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	60-85	20-40	5-20
1975:												
Oylen----------	0-13	Sandy loam-----	SM, SC-SM	A-2-4, A-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	13-22	Loam, sandy loam.	SC, CL, SC-SM, CL-ML	A-4	0	0	100	85-100	60-85	35-60	20-30	5-10
	22-52	Loamy sand, sand, coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP
	52-60	Sand, coarse sand, gravelly sand.	SP, SP-SM	A-1-b, A-3, A-2-4	0	0	90-100	60-100	35-55	3-10	---	NP

ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1997:												
Vallers---------	0-15	Silty clay loam	OL, CL, ML	A-6, A-7	0	0	95-100	95-100	95-100	85-95	30-50	11-20
	15-27	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	0	95-100	90-100	80-95	50-80	30-40	11-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	60-85	20-40	5-20
Hamerly---------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	9-21	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	21-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Winger----------	0-22	Silty clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	22-35	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	2-15
	35-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-100	75-95	50-75	20-45	3-25

PHYSICAL PROPERTIES OF THE SOILS

(Entries under "Erosion factors—T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
20B:											
Chapett---------	0-8	10-20	1.35-1.65	0.60-2.00	0.13-0.19	Low------	2.0-4.0	0.20	0.20	5	3
	8-23	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32		
	23-33	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28		
	33-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28		
20C2:											
Chapett---------	0-9	10-20	1.35-1.65	0.60-2.00	0.13-0.19	Low------	2.0-4.0	0.20	0.20	5	3
	9-26	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32		
	26-43	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28		
	43-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28		
20E:											
Chapett---------	0-7	10-20	1.35-1.65	0.60-2.00	0.13-0.19	Low------	2.0-4.0	0.20	0.20	5	3
	7-20	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32		
	20-33	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28		
	33-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28		
26:											
Aazdahl---------	0-13	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	4.0-6.0	0.24	0.24	5	6
	13-19	27-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	1.0-3.0	0.37	0.37		
	19-60	24-35	1.50-1.65	0.20-0.60	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
33B:											
Barnes----------	0-7	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6
	7-13	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32		
	13-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43		
36:											
Flom----------	0-16	27-35	1.25-1.45	0.20-0.60	0.18-0.22	Moderate	5.0-8.0	0.28	0.28	5	7
	16-24	24-35	1.45-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	24-60	24-35	1.55-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
38B:											
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6
	9-20	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
	20-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
38C:											
Waukon----------	0-8	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6
	8-20	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
	20-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
38E:											
Waukon----------	0-7	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6
	7-26	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
	26-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
40B:											
Nebish----------	0-7	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	7-26	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	26-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		
40C:											
Nebish----------	0-8	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	8-26	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	26-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
40E:											
Nebish----------	0-9	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	9-22	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	22-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		
47:											
Colvin----------	0-10	27-34	1.20-1.50	0.20-0.60	0.20-0.22	Moderate	4.0-7.0	0.32	0.32	5	4L
	10-26	18-34	1.20-1.50	0.20-0.60	0.16-0.20	Moderate	0.0-5.0	0.32	0.32		
	26-60	18-34	1.30-1.50	0.20-0.60	0.15-0.20	Moderate	0.0-1.0	0.32	0.32		
63:											
Rockwell--------	0-18	20-30	1.20-1.45	0.60-2.00	0.18-0.22	Low------	4.0-8.0	0.24	0.24	5	4L
	18-25	5-30	1.35-1.50	2.00-6.00	0.15-0.17	Low------	0.5-1.0	0.24	0.24		
	25-32	3-10	1.40-1.60	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.24	0.24		
	32-60	15-30	1.40-1.60	0.20-2.00	0.18-0.22	Low------	0.0-0.5	0.24	0.24		
108:											
McIntosh--------	0-9	18-27	1.35-1.50	0.60-2.00	0.20-0.24	Low------	4.0-7.0	0.28	0.28	5	4L
	9-30	18-35	1.40-1.50	0.60-2.00	0.16-0.22	Moderate	0.5-1.0	0.43	0.43		
	30-60	18-35	1.30-1.60	0.20-2.00	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
111:											
Hangaard--------	0-10	8-18	1.25-1.45	2.00-6.00	0.10-0.14	Low------	3.0-8.0	0.20	0.20	5	3
	10-18	5-15	1.50-1.70	6.00-20.00	0.07-0.11	Low------	1.0-3.0	0.20	0.20		
	18-60	2-10	1.50-1.70	6.00-40.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
121:											
Wykeham---------	0-8	5-18	1.30-1.55	0.60-6.00	0.13-0.18	Low------	2.0-6.0	0.17	0.20	5	3
	8-11	5-15	1.50-1.70	0.60-2.00	0.10-0.17	Low------	1.0-2.0	0.24	0.28		
	11-21	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.5-1.0	0.24	0.28		
	21-60	10-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.28		
125:											
Beltrami--------	0-4	6-18	1.30-1.40	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.32	0.32	5	5
	4-8	5-15	1.40-1.65	0.60-6.00	0.11-0.19	Low------	1.0-3.0	0.32	0.32		
	8-22	18-35	1.50-1.65	0.20-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	22-60	18-30	1.50-1.70	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
133A:											
Dalbo----------	0-6	20-27	1.25-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.43	---	5	6
	6-41	35-60	1.25-1.45	0.06-0.60	0.10-0.18	High-----	0.5-2.0	0.32	---		
	41-60	24-35	1.30-1.60	0.20-2.00	0.20-0.22	Moderate	0.0-0.5	0.32	---		
133B:											
Dalbo----------	0-7	20-27	1.25-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.43	---	5	6
	7-21	35-60	1.25-1.45	0.06-0.60	0.10-0.18	High-----	0.5-2.0	0.32	---		
	21-60	24-35	1.30-1.60	0.20-2.00	0.20-0.22	Moderate	0.0-0.5	0.32	---		
133C:											
Dalbo----------	0-7	20-27	1.25-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.43	---	5	6
	7-25	35-60	1.25-1.45	0.06-0.60	0.10-0.18	High-----	0.5-2.0	0.32	---		
	25-60	24-35	1.30-1.60	0.20-2.00	0.20-0.22	Moderate	0.0-0.5	0.32	---		
133E:											
Dalbo----------	0-7	20-27	1.25-1.45	0.60-2.00	0.22-0.24	Low------	2.0-4.0	0.43	---	5	6
	7-29	35-60	1.25-1.45	0.06-0.60	0.10-0.18	High-----	0.5-2.0	0.32	---		
	29-60	24-35	1.30-1.60	0.20-2.00	0.20-0.22	Moderate	0.0-0.5	0.32	---		
137:											
Dovray----------	0-10	40-60	1.20-1.30	0.06-0.60	0.14-0.18	High-----	5.0-10	0.28	0.28	5	4
	10-43	40-60	1.20-1.30	0.06-0.60	0.13-0.16	High-----	1.0-3.0	0.37	0.37		
	43-54	40-60	1.20-1.30	0.06-0.60	0.13-0.16	High-----	0.0-1.0	0.37	0.37		
	54-60	25-60	1.20-1.40	0.06-0.20	0.13-0.19	High-----	0.0-0.5	0.37	0.37		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
141B:											
Egeland---------	0-9	10-18	1.25-1.35	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20	5	3
	9-16	10-18	1.30-1.45	2.00-6.00	0.09-0.15	Low------	0.5-2.0	0.20	0.20		
	16-60	6-14	1.40-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.17	0.17		
141C:											
Egeland---------	0-13	10-18	1.25-1.35	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20	5	3
	13-22	10-18	1.30-1.45	2.00-6.00	0.09-0.15	Low------	0.5-2.0	0.20	0.20		
	22-60	6-14	1.40-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.17	0.17		
168B:											
Forman----------	0-8	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6
	8-15	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32		
	15-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43		
168C2:											
Forman----------	0-7	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6
	7-16	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32		
	16-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43		
168D2:											
Forman----------	0-8	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6
	8-15	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32		
	15-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43		
168E:											
Forman----------	0-7	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6
	7-15	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32		
	15-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43		
171B:											
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	8-14	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	14-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
180:											
Gonvick---------	0-12	10-27	1.30-1.45	0.60-2.00	0.20-0.22	Moderate	2.0-5.0	0.24	0.24	5	6
	12-34	22-35	1.35-1.50	0.20-2.00	0.15-0.19	Moderate	1.0-3.0	0.32	0.32		
	34-60	18-35	1.40-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
184:											
Hamerly---------	0-10	18-27	1.20-1.60	0.60-2.00	0.20-0.24	Low------	4.0-7.0	0.28	0.28	5	4L
	10-24	18-30	1.20-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32		
	24-60	18-30	1.30-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37		
191:											
Epoufette-------	0-6	5-15	1.35-1.50	2.00-6.00	0.09-0.14	Low------	2.0-6.0	0.20	---	4	3
	6-12	5-15	1.40-1.55	6.00-20.00	0.05-0.07	Low------	1.0-3.0	0.17	0.17		
	12-20	8-18	1.40-1.60	2.00-6.00	0.08-0.14	Low------	0.0-0.5	0.17	0.17		
	20-60	0-8	1.40-1.65	>20.00	0.01-0.03	Low------	0.0-0.5	0.10	0.15		
202:											
Meehan----------	0-13	4-10	1.35-1.65	2.00-6.00	0.10-0.12	Low------	0.5-3.0	0.17	0.17	5	2
	13-25	4-9	1.60-1.70	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.15		
	25-60	1-4	1.60-1.70	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
207D:											
Nymore----------	0-6	2-12	1.45-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.17	0.17	5	2
	6-46	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		
	46-60	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
267B:											
Snellman--------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	2-16	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	16-31	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	31-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
267C:											
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	3-16	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	16-28	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	28-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
267E:											
Snellman--------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	2-14	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	14-28	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	28-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
315A:											
Bootlake--------	0-6	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	6-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	13-28	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	28-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
315B:											
Bootlake--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-9	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	9-21	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	21-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
332B:											
Sugarbush-------	0-4	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	4-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	13-18	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	18-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
335:											
Urness----------	0-7	18-27	0.25-0.50	0.20-2.00	0.18-0.24	Moderate	10-50	0.28	0.28	5	4L
	7-60	18-35	0.30-1.00	0.20-2.00	0.16-0.22	Moderate	10-50	0.28	0.28		
339:											
Fordville-------	0-10	18-25	1.20-1.30	0.60-2.00	0.18-0.20	Low------	3.0-7.0	0.24	0.24	4	6
	10-17	18-30	1.25-1.40	0.60-2.00	0.18-0.21	Moderate	1.0-4.0	0.28	0.28		
	17-28	15-30	1.25-1.45	0.60-6.00	0.12-0.18	Low------	0.0-2.0	0.28	0.28		
	28-60	0-5	1.60-1.80	6.00-60.00	0.03-0.06	Low------	0.0-0.5	0.10	0.17		
344:											
Quam----------	0-10	28-35	1.00-1.35	0.20-0.60	0.18-0.22	Moderate	6.0-15	0.28	0.28	5	7
	10-42	22-35	1.25-1.45	0.20-0.60	0.16-0.22	Moderate	4.0-10	0.28	0.28		
	42-60	20-35	1.40-1.65	0.20-0.60	0.14-0.19	Moderate	1.0-3.0	0.37	0.37		
351:											
Colvin----------	0-12	27-34	1.20-1.50	0.20-0.60	0.20-0.22	Moderate	4.0-10	0.32	0.32	5	4L
	12-45	18-34	1.30-1.50	0.06-2.00	0.16-0.20	Moderate	0.0-5.0	0.32	0.32		
	45-60	18-34	1.30-1.40	0.06-2.00	0.15-0.20	Moderate	0.0-1.0	0.32	0.32		
375:											
Forada----------	0-14	10-22	1.20-1.40	0.60-2.00	0.20-0.22	Low------	5.0-9.0	0.24	0.24	4	5
	14-22	8-18	1.30-1.50	0.60-6.00	0.12-0.19	Low------	0.5-1.0	0.28	0.28		
	22-60	0-5	1.50-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.15	0.17		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
398:											
Winger----------	0-13	27-35	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L
	13-37	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	0.0-0.5	0.28	0.28		
	37-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	---	0.28	0.28		
406A:											
Dorset----------	0-9	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	9-21	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	21-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
406B:											
Dorset----------	0-10	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	10-17	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	17-29	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17		
	29-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
413:											
Osakis----------	0-8	8-18	1.30-1.50	2.00-6.00	0.14-0.18	Low------	2.0-4.0	0.28	0.28	3	3
	8-18	8-18	1.30-1.50	0.60-6.00	0.14-0.19	Low------	0.5-1.0	0.28	0.28		
	18-60	0-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.10		
418:											
Lamoure---------	0-39	27-34	1.15-1.25	0.20-2.00	0.19-0.22	Moderate	4.0-8.0	0.28	0.28	5	4L
	39-60	20-34	1.25-1.40	0.20-2.00	0.09-0.18	Moderate	0.0-0.5	0.28	0.28		
422B:											
Bygland---------	0-8	27-40	1.20-1.40	0.20-0.60	0.18-0.22	High-----	4.0-8.0	0.28	0.28	5	7
	8-22	35-60	1.20-1.40	0.06-0.60	0.10-0.19	High-----	1.0-3.0	0.32	0.32		
	22-38	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.5-1.0	0.43	0.43		
	38-60	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.0-0.5	0.43	0.43		
422C:											
Bygland---------	0-8	27-40	1.20-1.40	0.20-0.60	0.18-0.22	High-----	4.0-8.0	0.28	0.28	5	7
	8-16	35-60	1.20-1.40	0.06-0.60	0.10-0.19	High-----	1.0-3.0	0.32	0.32		
	16-25	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.5-1.0	0.43	0.43		
	25-60	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.0-0.5	0.43	0.43		
503B:											
Balmlake--------	0-3	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	3-20	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	20-28	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	28-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
503C:											
Balmlake--------	0-2	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	2-17	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	17-29	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	29-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
503E:											
Balmlake--------	0-2	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	2-15	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	15-28	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	28-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
508:											
Wyndmere--------	0-14	5-15	1.30-1.60	2.00-6.00	0.13-0.18	Low------	5.0-13	0.20	0.20	5	3
	14-24	0-10	1.30-1.70	2.00-6.00	0.12-0.17	Low------	1.0-8.0	0.20	0.20		
	24-60	0-10	1.30-1.70	2.00-6.00	0.06-0.16	Low------	0.0-1.0	0.24	0.24		
540:											
Seelyeville-----	0-24	---	0.10-0.25	0.20-6.00	0.35-0.45	---	25-99	---	---	3	2
	24-60	---	0.10-0.25	0.20-6.00	0.35-0.45	---	25-99	---	---		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
541:											
Rifle----------	0-14	---	0.20-0.35	0.60-6.00	0.48-0.58	---	75-99	---	---	3	5
	14-60	---	0.08-0.20	0.60-6.00	0.48-0.58	---	25-99	---	---		
544:											
Cathro----------	0-8	---	0.28-0.45	0.20-6.00	0.45-0.55	---	60-85	---	---	2	2
	8-22	---	0.15-0.30	0.20-6.00	0.35-0.45	---	60-85	---	---		
	22-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	0.20	0.24		
564:											
Friendship------	0-3	3-8	1.50-1.65	6.00-20.00	0.08-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	3-31	0-4	1.50-1.65	6.00-20.00	0.05-0.08	Low------	0.0-0.5	0.15	0.15		
	31-60	0-4	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.0-0.5	0.15	0.15		
567A:											
Verndale--------	0-8	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	8-15	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	15-33	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	33-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
567B:											
Verndale--------	0-7	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	7-13	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	13-31	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	31-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
579C2:											
Formdale--------	0-7	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	7-11	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	11-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
Langhei---------	0-7	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	7-13	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.32		
	13-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.37	0.37		
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3
	8-18	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10		
	18-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10		
624:											
Rosy----------	0-20	3-12	1.40-1.55	0.60-2.00	0.14-0.19	Low------	0.5-2.0	0.24	0.24	5	3
	20-26	8-18	1.50-1.65	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.28	0.28		
	26-60	6-18	1.55-1.70	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.28	0.28		
701:											
Runeberg--------	0-10	10-25	1.40-1.55	0.60-2.00	0.18-0.25	Low------	4.0-12	0.24	0.24	5	5
	10-36	10-18	1.60-1.75	0.20-0.60	0.12-0.18	Low------	0.5-2.0	0.24	0.24		
	36-60	6-15	1.65-1.75	0.06-0.60	0.06-0.13	Low------	0.0-0.5	0.24	0.24		
711B:											
Arvilla---------	0-8	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3
	8-15	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20		
	15-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20		
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3
	8-15	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10		
	15-36	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10		
	36-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10		
711C:											
Arvilla---------	0-8	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3
	8-15	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20		
	15-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
711C:											
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3
	8-15	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10		
	15-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10		
718B:											
Naytahwaush-----	0-4	10-20	1.30-1.55	0.60-2.00	0.20-0.24	Moderate	3.0-6.0	0.28	0.28	5	6
	4-7	8-15	1.30-1.50	0.20-2.00	0.16-0.24	Moderate	0.5-1.0	0.28	0.28		
	7-30	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32		
	30-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
718C:											
Naytahwaush-----	0-4	10-20	1.30-1.55	0.60-2.00	0.20-0.24	Moderate	3.0-6.0	0.28	0.28	5	6
	4-6	8-15	1.30-1.50	0.20-2.00	0.16-0.24	Moderate	0.5-1.0	0.28	0.28		
	6-23	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32		
	23-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
718E:											
Naytahwaush-----	0-3	10-20	1.30-1.55	0.60-2.00	0.20-0.24	Moderate	3.0-6.0	0.28	0.28	5	6
	3-7	8-15	1.30-1.50	0.20-2.00	0.16-0.24	Moderate	0.5-1.0	0.28	0.28		
	7-23	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32		
	23-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
721E:											
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	7-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
746:											
Haslie----------	0-8	---	0.10-0.30	0.60-6.00	0.35-0.48	---	60-90	---	---	1	2
	8-43	---	0.10-0.30	0.60-6.00	0.35-0.48	---	60-90	---	---		
	43-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28		
747B:											
Audubon---------	0-9	40-60	1.30-1.40	0.06-0.20	0.16-0.22	High-----	3.0-5.0	0.28	0.28	5	4
	9-29	35-60	1.30-1.40	0.06-0.20	0.13-0.19	High-----	0.5-1.0	0.43	0.43		
	29-60	35-60	1.40-1.50	0.06-0.20	0.11-0.16	High-----	0.0-0.5	0.43	0.43		
753D:											
Abbeylake-------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	8-24	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	24-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
753E:											
Abbeylake-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	3-21	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	21-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
765:											
Smiley----------	0-13	8-20	1.20-1.50	0.60-2.00	0.20-0.24	Low------	2.0-5.0	0.24	0.24	5	5
	13-26	18-35	1.35-1.60	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.24	0.24		
	26-47	16-32	1.40-1.70	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.24	0.24		
	47-60	16-32	1.40-1.70	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.24	0.24		
767:											
Auganaush-------	0-5	12-27	1.35-1.55	0.60-2.00	0.20-0.24	Low------	3.0-8.0	0.32	0.32	5	6
	5-8	5-18	1.40-1.60	0.60-2.00	0.16-0.24	Low------	1.0-3.0	0.24	0.24		
	8-22	35-60	1.25-1.50	0.06-0.60	0.10-0.19	High-----	0.0-0.5	0.28	0.28		
	22-60	30-45	1.30-1.55	0.06-0.60	0.14-0.19	Moderate	0.0-0.5	0.32	0.32		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
775B:											
Sugarbush--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	13-25	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	25-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
Two Inlets------	0-4	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-1.0	0.10	0.15	5	2
	4-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	13-27	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	27-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
775C:											
Sugarbush--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	10-22	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	22-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
Two Inlets------	0-2	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-1.0	0.10	0.15	5	2
	2-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	10-27	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	27-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
776B:											
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	3-12	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	12-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	32-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-17	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	17-28	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	28-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
776C:											
Snellman--------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	2-16	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	16-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	32-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush--------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	14-21	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	21-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
776E:											
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	3-14	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	14-26	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	26-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush--------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	10-19	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	19-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
778B:											
Dorset----------	0-10	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	10-20	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	20-24	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17		
	24-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
778B:											
Corliss---------	0-5	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	5-13	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15		
	13-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
778C:											
Dorset----------	0-9	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	9-15	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	15-18	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17		
	18-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
Corliss---------	0-5	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	5-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
780B:											
Audubon---------	0-9	40-60	1.30-1.40	0.06-0.20	0.16-0.22	High-----	3.0-5.0	0.28	0.28	5	4
	9-27	35-60	1.30-1.40	0.06-0.20	0.13-0.19	High-----	0.5-1.0	0.43	0.43		
	27-60	35-60	1.40-1.50	0.06-0.20	0.11-0.16	High-----	0.0-0.5	0.43	0.43		
Boyerlake-------	0-9	35-40	1.40-1.50	0.06-0.20	0.16-0.19	Moderate	1.0-3.0	0.24	0.24	5	4
	9-17	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.5-1.0	0.37	0.37		
	17-60	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.0-0.5	0.37	0.37		
780C2:											
Audubon---------	0-10	40-60	1.30-1.40	0.06-0.20	0.16-0.22	High-----	3.0-5.0	0.28	0.28	5	4
	10-20	35-60	1.30-1.40	0.06-0.20	0.13-0.19	High-----	0.5-1.0	0.43	0.43		
	20-60	35-60	1.40-1.50	0.06-0.20	0.11-0.16	High-----	0.0-0.5	0.43	0.43		
Boyerlake-------	0-9	35-40	1.40-1.50	0.06-0.20	0.16-0.19	Moderate	1.0-3.0	0.24	0.24	5	4
	9-19	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.5-1.0	0.37	0.37		
	19-60	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.0-0.5	0.37	0.37		
780D2:											
Audubon---------	0-10	40-60	1.30-1.40	0.06-0.20	0.16-0.22	High-----	3.0-5.0	0.28	0.28	5	4
	10-22	35-60	1.30-1.40	0.06-0.20	0.13-0.19	High-----	0.5-1.0	0.43	0.43		
	22-60	35-60	1.40-1.50	0.06-0.20	0.11-0.16	High-----	0.0-0.5	0.43	0.43		
Boyerlake-------	0-7	35-40	1.40-1.50	0.06-0.20	0.16-0.19	Moderate	1.0-3.0	0.24	0.24	5	4
	7-37	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.5-1.0	0.37	0.37		
	37-60	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.0-0.5	0.37	0.37		
785:											
Hamerly---------	0-8	27-35	1.20-1.50	0.60-2.00	0.17-0.22	Moderate	4.0-7.0	0.28	0.28	5	4L
	8-33	18-35	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	---	0.28	0.32		
	33-60	18-35	1.30-1.60	0.20-0.60	0.14-0.19	Moderate	---	0.37	0.37		
Winger----------	0-15	27-35	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L
	15-22	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	---	0.28	0.28		
	22-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	---	0.28	0.28		
786:											
Winger----------	0-14	27-35	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L
	14-33	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	---	0.28	0.28		
	33-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	---	0.28	0.28		
Hamerly---------	0-9	27-35	1.20-1.50	0.60-2.00	0.17-0.22	Moderate	4.0-7.0	0.28	0.28	5	4L
	9-18	18-35	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	---	0.28	0.32		
	18-60	18-35	1.30-1.60	0.20-0.60	0.14-0.19	Moderate	---	0.37	0.37		
Colvin----------	0-15	27-34	1.20-1.50	0.20-0.60	0.20-0.22	Moderate	4.0-10	0.32	0.32	5	4L
	15-38	18-34	1.30-1.50	0.06-2.00	0.16-0.20	Moderate	0.0-5.0	0.32	0.32		
	38-60	18-34	1.30-1.40	0.06-2.00	0.15-0.20	Moderate	0.0-1.0	0.32	0.32		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
797:											
Mooselake--------	0-15	---	0.05-0.30	0.60-6.00	0.35-0.55	---	25-99	---	---	3	5
	15-60	---	0.10-0.20	0.60-6.00	0.40-0.50	---	25-99	---	---		
Lupton----------	0-15	---	0.10-0.35	0.20-6.00	0.35-0.45	---	70-90	---	---	3	2
	15-60	---	0.10-0.35	0.20-6.00	0.35-0.45	---	50-90	---	---		
867B:											
Graycalm---------	0-6	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	6-21	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	21-46	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
	46-60	0-10	1.50-1.65	6.00-20.00	0.04-0.06	Low------	0.0-0.5	0.10	0.15		
Menahga---------	0-3	2-10	1.20-1.50	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.15	0.15	5	2
	3-42	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.5-1.0	0.15	0.15		
	42-60	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
867C:											
Graycalm---------	0-6	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	6-26	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	26-55	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
	55-60	0-10	1.50-1.65	6.00-20.00	0.04-0.06	Low------	0.0-0.5	0.10	0.15		
Menahga---------	0-2	2-10	1.20-1.50	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.15	0.15	5	2
	2-40	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.5-1.0	0.15	0.15		
	40-60	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
867E:											
Graycalm---------	0-3	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	3-37	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	37-60	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
Menahga---------	0-12	2-10	1.20-1.50	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.15	0.15	5	2
	12-52	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.5-1.0	0.15	0.15		
	52-60	0-5	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
903B:											
Barnes----------	0-9	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6
	9-19	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32		
	19-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43		
Langhei---------	0-6	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	6-17	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
	17-60	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
903C2:											
Barnes----------	0-8	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6
	8-19	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32		
	19-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43		
Langhei---------	0-7	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	7-16	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
	16-60	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
931C2:											
Formdale--------	0-7	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	7-15	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	15-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
Langhei---------	0-8	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	8-19	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.32		
	19-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.37	0.37		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
942D2:											
Langhei---------	0-7	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	7-11	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
	11-60	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
Barnes----------	0-7	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6
	7-15	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32		
	15-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43		
943D2:											
Langhei---------	0-6	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	6-13	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.32		
	13-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.37	0.37		
Formdale--------	0-7	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	7-14	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	14-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
943E:											
Langhei---------	0-8	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L
	8-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.32		
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	8-16	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	16-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
951B:											
Nebish----------	0-2	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	2-7	5-12	1.40-1.65	2.00-6.00	0.11-0.19	Low------	0.5-1.0	0.24	0.24		
	7-26	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	26-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		
Sugarbush-------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-9	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	9-17	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	17-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
951C:											
Nebish----------	0-3	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	3-11	5-12	1.40-1.65	2.00-6.00	0.11-0.19	Low------	0.5-1.0	0.24	0.24		
	11-26	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	26-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		
Sugarbush-------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-9	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	9-15	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	15-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
951E:											
Nebish----------	0-3	5-20	1.30-1.45	0.60-2.00	0.20-0.22	Low------	1.0-2.0	0.32	0.32	5	5
	3-11	5-12	1.40-1.65	2.00-6.00	0.11-0.19	Low------	0.5-1.0	0.24	0.24		
	11-27	22-35	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	27-60	18-30	1.50-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32		
Sugarbush-------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-8	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	8-16	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	16-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
1015:											
Udipsamments----	0-14	1-15	1.50-1.70	2.00-20.00	0.05-0.10	Low------	---	0.15	0.15	5	2
	14-60	1-10	1.50-1.70	6.00-20.00	0.05-0.08	Low------	---	0.10	0.10		
	60-80	1-10	1.50-1.70	>20.00	0.03-0.05	Low------	---	0.05	0.10		

Low------

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1016:											
Udorthents------	0-60	---	---	---	---	---	---	---	---	---	---
	60-80	---	---	0.06-6.00	---	---	---	---	---		
1027:											
Udorthents.											
1030:											
Pits.											
Udipsamments----	0-14	1-15	1.50-1.70	2.00-20.00	0.05-0.10	Low------	---	0.15	0.15	5	2
	14-60	1-10	1.50-1.70	6.00-20.00	0.05-0.08	Low------	---	0.10	0.10		
	60-80	1-10	1.50-1.70	>20.00	0.03-0.05	Low------	---	0.05	0.10		
1104B:											
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6
	9-17	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
	17-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
Dorset----------	0-8	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	8-14	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	14-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
1104C:											
Waukon----------	0-8	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6
	8-21	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
	21-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32		
Dorset----------	0-7	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	7-16	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	16-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
1111:											
Nidaros---------	0-24	---	0.15-0.45	0.20-6.00	0.35-0.45	---	55-85	---	---	2	2
	24-38	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.20	0.24		
	38-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15		
1113:											
Haslie----------	0-20	---	0.10-0.30	0.60-6.00	0.35-0.48	---	60-90	---	---	1	8
	20-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28		
Seelyeville-----	0-18	---	0.10-0.25	0.20-6.00	0.35-0.45	---	25-99	---	---	3	8
	18-60	---	0.10-0.25	0.20-6.00	0.35-0.45	---	25-99	---	---		
Cathro----------	0-23	---	0.28-0.45	0.20-6.00	0.45-0.55	---	60-85	---	---	2	8
	23-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	---	---		
1125B:											
Sverdrup--------	0-10	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3
	10-25	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	1.0-3.0	0.20	0.20		
	25-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15		
Abbeylake-------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	9-28	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	28-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
1125C:											
Sverdrup--------	0-10	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3
	10-41	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	1.0-3.0	0.20	0.20		
	41-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1125C:											
Abbeylake--------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	9-26	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	26-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
1126B:											
Verndale---------	0-8	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	8-15	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	15-47	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	47-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
Nymore----------	0-7	2-12	1.45-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.17	0.17	5	2
	7-41	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		
	41-60	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		
1127A:											
Bootlake---------	0-7	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	7-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	13-18	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	18-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
Graycalm---------	0-7	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	7-22	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	22-56	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
	56-60	0-10	1.50-1.65	6.00-20.00	0.04-0.06	Low------	0.0-0.5	0.10	0.15		
1127B:											
Bootlake---------	0-6	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	6-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	10-16	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	16-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
Graycalm---------	0-6	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	6-37	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	37-60	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
1128:											
Cathro----------	0-8	---	0.28-0.45	0.20-6.00	0.45-0.55	---	50-95	---	---	2	2
	8-22	---	0.18-0.35	0.20-6.00	0.35-0.45	---	50-95	---	---		
	22-60	6-30	1.40-1.70	0.60-20.00	0.10-0.20	Low------	---	0.24	0.24		
1129:											
Lindaas---------	0-14	27-35	1.10-1.30	0.60-2.00	0.14-0.17	Moderate	4.0-7.0	0.28	0.28	5	7
	14-29	35-60	1.20-1.40	0.06-0.20	0.10-0.14	High-----	2.0-4.0	0.32	0.32		
	29-60	25-40	1.20-1.50	0.20-0.60	0.11-0.15	Moderate	0.5-1.0	0.32	0.32		
1130:											
Wolverton-------	0-8	10-20	1.20-1.40	2.00-6.00	0.16-0.20	Low------	2.0-4.0	0.28	0.28	5	3
	8-12	5-15	1.30-1.50	2.00-20.00	0.06-0.09	Low------	0.5-1.0	0.20	0.20		
	12-41	2-10	1.30-1.60	2.00-20.00	0.05-0.07	Low------	0.0-0.5	0.20	0.20		
	41-60	18-35	1.40-1.60	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.28	0.32		
1131B:											
Verndale---------	0-12	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	12-16	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	16-35	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	35-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
Abbeylake--------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	7-22	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	22-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1132B:											
Eagleview-------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	9-28	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	28-48	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	48-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Balmlake--------	0-7	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	7-17	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	17-24	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	24-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
1132C:											
Eagleview-------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	7-23	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	23-37	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	37-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Balmlake--------	0-3	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	3-22	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	22-29	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	29-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
1132E:											
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	3-15	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	15-46	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	46-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Balmlake--------	0-3	3-12	1.25-1.40	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.28	0.28	5	3
	3-17	3-12	1.30-1.50	2.00-6.00	0.10-0.17	Low------	0.5-1.0	0.28	0.28		
	17-27	8-18	1.35-1.55	0.60-2.00	0.13-0.20	Low------	0.0-0.5	0.37	0.37		
	27-60	6-14	1.30-1.65	0.60-2.00	0.10-0.22	Low------	0.0-0.5	0.28	0.28		
1135:											
Foxlake---------	0-19	35-60	1.30-1.40	0.06-0.20	0.18-0.22	High-----	3.0-5.0	0.28	0.28	5	4
	19-38	35-60	1.30-1.40	0.06-0.20	0.16-0.19	High-----	1.0-3.0	0.43	0.43		
	38-49	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.5-1.0	0.43	0.43		
	49-60	35-60	1.40-1.50	0.06-0.20	0.16-0.19	High-----	0.0-0.5	0.43	0.43		
1136:											
Nidaros---------	0-31	---	0.15-0.45	0.20-6.00	0.35-0.45	---	55-85	---	---	2	2
	31-49	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.20	0.24		
	49-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15		
1137B:											
Birchlake-------	0-8	30-40	1.30-1.40	0.20-0.60	0.18-0.22	Moderate	3.0-5.0	0.32	0.32	5	7
	8-27	35-60	1.30-1.40	0.06-0.20	0.13-0.16	High-----	0.5-1.0	0.32	0.32		
	27-60	30-40	1.40-1.60	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
	40-80	30-40	1.45-1.65	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
1137C:											
Birchlake-------	0-8	30-40	1.30-1.40	0.20-0.60	0.18-0.22	Moderate	3.0-5.0	0.32	0.32	5	7
	8-17	35-60	1.30-1.40	0.06-0.20	0.13-0.16	High-----	0.5-1.0	0.32	0.32		
	17-60	30-40	1.40-1.60	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
	40-80	30-40	1.45-1.65	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
1137D:											
Birchlake-------	0-7	30-40	1.30-1.40	0.20-0.60	0.18-0.22	Moderate	3.0-5.0	0.32	0.32	5	7
	7-15	35-60	1.30-1.40	0.06-0.20	0.13-0.16	High-----	0.5-1.0	0.32	0.32		
	15-60	30-40	1.40-1.60	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
	40-80	30-40	1.45-1.65	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1137E:											
Birchlake--------	0-7	30-40	1.30-1.40	0.20-0.60	0.18-0.22	Moderate	3.0-5.0	0.32	0.32	5	7
	7-16	35-60	1.30-1.40	0.06-0.20	0.13-0.16	High-----	0.5-1.0	0.32	0.32		
	16-60	30-40	1.40-1.60	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
	40-80	30-40	1.45-1.65	0.06-0.20	0.16-0.19	Moderate	0.0-0.5	0.43	0.43		
1138:											
Rushlake---------	0-7	3-10	1.50-1.70	6.00-20.00	0.10-0.12	Low------	0.5-4.0	0.17	0.17	5	2
	7-60	1-10	1.50-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.10		
Hangaard---------	0-13	8-18	1.25-1.45	2.00-6.00	0.10-0.14	Low------	3.0-8.0	0.20	0.20	5	3
	13-60	2-10	1.50-1.70	6.00-40.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
1140B:											
Eagleview--------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	9-22	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	22-40	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	40-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Snellman---------	0-7	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	7-18	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	18-34	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	34-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1140C:											
Eagleview--------	0-10	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	10-30	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	30-49	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	49-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Snellman---------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	3-11	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	11-21	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	21-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1149:											
Hamerly----------	0-10	27-35	1.20-1.50	0.60-2.00	0.17-0.22	Moderate	4.0-7.0	0.28	0.28	5	4L
	10-26	18-35	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	---	0.28	0.32		
	26-60	18-35	1.30-1.60	0.20-0.60	0.14-0.19	Moderate	---	0.37	0.37		
1195B:											
Sybil-----------	0-5	3-10	1.35-1.65	6.00-20.00	0.07-0.12	Low------	1.0-4.0	0.17	0.17	5	2
	5-10	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17		
	10-15	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24		
	15-32	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17		
	32-60	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15		
Eagleview--------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	7-19	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	19-33	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	33-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1195C:											
Sybil-----------	0-8	3-10	1.35-1.65	6.00-20.00	0.07-0.12	Low------	1.0-4.0	0.17	0.17	5	2
	8-17	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17		
	17-26	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24		
	26-37	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17		
	37-60	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1195C:											
Eagleview-------	0-4	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	4-15	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	15-28	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	28-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1195E:											
Sybil----------	0-4	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3
	4-15	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17		
	15-19	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24		
	19-25	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17		
	25-60	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15		
Eagleview-------	0-5	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	5-22	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	22-39	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	39-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1196B:											
Lida----------	0-9	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3
	9-13	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17		
	13-25	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24		
	25-45	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15		
	45-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10		
Two Inlets------	0-7	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3
	7-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	14-29	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	29-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
1196C:											
Lida----------	0-8	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3
	8-17	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17		
	17-25	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24		
	25-41	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15		
	41-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10		
Two Inlets------	0-4	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3
	4-9	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	9-38	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	38-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
1196E:											
Lida----------	0-3	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3
	3-14	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17		
	14-20	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24		
	20-27	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15		
	27-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10		
Two Inlets------	0-3	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3
	3-7	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	7-21	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	21-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
1200:											
Egglake---------	0-4	8-15	1.35-1.60	0.60-6.00	0.10-0.21	Low------	2.0-4.0	0.28	0.28	5	5
	4-9	3-10	1.50-1.70	0.60-6.00	0.12-0.14	Low------	0.5-2.0	0.24	0.24		
	9-20	18-30	1.50-1.70	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.32	0.32		
	20-60	10-18	1.60-1.80	0.60-2.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1201C:											
Sugarbush--------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	14-24	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	24-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
Snellman---------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	2-14	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	14-29	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	29-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1201E:											
Sugarbush--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-11	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	11-15	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	15-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
Snellman---------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3
	2-15	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28		
	15-28	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28		
	28-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
	41-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1210:											
Paddock----------	0-9	8-15	1.45-1.75	0.60-2.00	0.13-0.18	Low------	2.0-6.0	0.24	0.24	4	3
	9-16	3-10	1.50-1.75	0.60-2.00	0.12-0.16	Low------	---	0.24	0.24		
	16-29	8-18	1.60-1.80	0.20-0.60	0.12-0.16	Low------	---	0.24	0.24		
	29-60	6-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		
Epoufette--------	0-8	5-15	1.35-1.50	2.00-6.00	0.09-0.14	Low------	2.0-6.0	0.20	---	4	3
	8-17	5-15	1.40-1.55	6.00-20.00	0.05-0.07	Low------	1.0-3.0	0.17	0.17		
	17-25	8-18	1.40-1.60	2.00-6.00	0.08-0.14	Low------	0.0-0.5	0.17	0.17		
	25-60	0-8	1.40-1.65	>20.00	0.01-0.03	Low------	0.0-0.5	0.10	0.15		
1211:											
Egglake----------	0-4	5-15	1.35-1.60	0.60-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	5	3
	4-9	3-10	1.50-1.70	0.60-6.00	0.12-0.14	Low------	0.5-2.0	0.24	0.24		
	9-25	18-30	1.50-1.70	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.32	0.32		
	25-60	10-18	1.60-1.80	0.60-2.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24		
Cathro----------	0-17	---	0.28-0.45	0.20-6.00	0.45-0.55	---	60-85	---	---	2	2
	17-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	0.20	0.24		
1225:											
Wykeham----------	0-8	5-18	1.30-1.55	0.60-6.00	0.13-0.18	Low------	2.0-6.0	0.17	0.20	5	3
	8-16	5-15	1.50-1.70	0.60-2.00	0.10-0.17	Low------	1.0-2.0	0.24	0.28		
	16-37	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.5-1.0	0.24	0.28		
	37-60	10-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.28		
Karlstad---------	0-12	5-15	1.20-1.45	2.00-6.00	0.13-0.18	Low------	1.0-4.0	0.24	0.24	3	3
	12-18	5-18	1.35-1.60	2.00-6.00	0.13-0.18	Low------	0.5-2.0	0.24	0.24		
	18-29	5-18	1.50-1.70	2.00-6.00	0.12-0.16	Low------	0.0-0.5	0.10	0.17		
	29-60	1-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.17		
1227:											
Quam----------	0-33	22-27	1.00-1.40	0.60-2.00	0.22-0.24	Low------	6.0-15	0.28	0.28	5	6
	33-50	22-35	1.25-1.45	0.20-0.60	0.16-0.22	Moderate	4.0-10	0.28	0.28		
	50-60	20-35	1.40-1.65	0.20-0.60	0.14-0.19	Moderate	1.0-3.0	0.37	0.37		
Cathro----------	0-24	---	0.28-0.45	0.20-6.00	0.45-0.55	---	60-85	---	---	2	8
	24-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	---	---		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1227:											
Urness----------	0-20	18-27	0.25-0.50	0.20-2.00	0.18-0.24	Moderate	10-50	0.28	0.28	5	4L
	20-45	18-35	0.30-1.00	0.20-2.00	0.16-0.22	Moderate	10-50	0.28	0.28		
	45-60	18-35	1.00-1.65	0.20-2.00	0.14-0.20	Moderate	---	0.28	0.28		
1230:											
Haslie----------	0-18	---	0.10-0.30	0.60-6.00	0.35-0.48	---	60-90	---	---	1	8
	18-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28		
Nidaros---------	0-38	---	0.15-0.45	0.20-6.00	0.35-0.45	---	55-85	---	---	2	8
	38-54	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.20	0.24		
	54-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15		
1234B:											
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	8-15	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	15-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
Buse----------	0-7	27-35	1.40-1.50	0.20-0.60	0.17-0.22	Moderate	1.0-3.0	0.28	0.28	5	4L
	7-60	18-35	1.55-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-1.0	0.37	0.37		
1235B:											
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6
	8-11	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37		
	11-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37		
Buse----------	0-8	18-27	1.40-1.50	0.20-0.60	0.17-0.20	Low------	1.0-3.0	0.28	0.28	5	4L
	8-60	18-35	1.55-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-1.0	0.37	0.37		
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3
	8-12	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10		
	12-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10		
1236B:											
Eagleview-------	0-2	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	2-11	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	11-48	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	48-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1236C:											
Eagleview-------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	7-23	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	23-37	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	37-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1236E:											
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	3-16	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	16-40	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	40-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
1238E:											
Two Inlets------	0-2	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-1.0	0.10	0.15	5	2
	2-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	10-33	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15		
	33-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10		
Sugarbush-------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-12	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	12-18	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	18-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1242D:											
Sandberg--------	0-7	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3
	7-19	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10		
	19-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10		
Arvilla---------	0-7	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3
	7-17	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20		
	17-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20		
1243B:											
Sol----------	0-3	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	3-17	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	17-30	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	30-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1243C:											
Sol----------	0-2	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	2-18	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	18-30	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	30-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1243E:											
Sol----------	0-3	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	3-18	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	18-36	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	36-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
1244B:											
Sol----------	0-2	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	2-21	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	21-30	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	30-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush-------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-13	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	13-21	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	21-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
1244C:											
Sol----------	0-2	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	2-22	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	22-31	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	31-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush-------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	2-18	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	18-38	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	38-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
1244E:											
Sol----------	0-3	4-16	1.50-1.65	0.60-2.00	0.12-0.20	Low------	1.0-3.0	0.24	0.24	5	8
	3-23	2-12	1.40-1.55	2.00-6.00	0.09-0.13	Low------	0.0-0.5	0.17	0.17		
	23-30	18-27	1.55-1.75	0.60-2.00	0.16-0.20	Moderate	0.0-0.5	0.32	0.32		
	30-60	8-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28		
Sugarbush-------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-17	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	17-47	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	47-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1246:											
Winger----------	0-15	27-35	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L
	15-37	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	---	0.28	0.28		
	37-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	---	0.28	0.28		
1247D:											
Corliss---------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	9-16	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15		
	16-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15		
Dorset----------	0-9	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3
	9-17	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28		
	17-25	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17		
	25-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15		
1248C:											
Nymore----------	0-7	2-12	1.45-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.17	0.17	5	2
	7-55	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		
	55-60	0-5	1.55-1.65	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.17	0.17		
Verndale--------	0-6	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	6-27	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	27-48	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	48-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
1249C:											
Graycalm--------	0-8	0-10	1.30-1.55	6.00-20.00	0.06-0.12	Low------	0.5-2.0	0.15	0.17	5	2
	8-18	0-15	1.25-1.60	6.00-20.00	0.05-0.10	Low------	0.0-0.5	0.10	0.15		
	18-37	0-10	1.50-1.65	6.00-20.00	0.04-0.09	Low------	0.0-0.5	0.10	0.15		
	37-60	0-10	1.50-1.65	6.00-20.00	0.04-0.06	Low------	0.0-0.5	0.10	0.15		
Bootlake--------	0-8	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	8-17	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	17-27	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	27-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
1250C:											
Abbeylake-------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2
	9-16	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10		
	16-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
Verndale--------	0-8	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3
	8-14	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24		
	14-28	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10		
	28-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10		
1251:											
Lamoure---------	0-41	20-26	1.10-1.25	0.20-2.00	0.19-0.22	Low------	4.0-8.0	0.28	0.28	5	4L
	41-53	20-34	1.20-1.35	0.20-2.00	0.17-0.20	Moderate	1.0-3.0	0.32	0.32		
	53-60	20-34	1.25-1.40	0.20-2.00	0.09-0.18	Moderate	0.0-0.5	0.28	0.28		
1252B:											
Bootlake--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	14-41	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	41-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
Eagleview-------	0-2	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	2-12	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	12-42	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	42-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1263C:											
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2
	3-17	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17		
	17-32	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15		
	32-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15		
Bootlake--------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3
	3-15	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.17	0.17		
	15-24	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24		
	24-60	1-5	1.50-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15		
1291:											
Sedgeville------	0-8	0-23	1.35-1.45	0.60-2.00	0.17-0.24	Low------	4.0-12	0.28	0.28	4	8
	8-34	8-17	1.40-1.50	0.60-2.00	0.10-0.22	Low------	1.0-12	0.32	0.43		
	34-60	2-5	1.55-1.70	6.00-20.00	0.04-0.16	Low------	1.0-12	0.10	0.15		
1306:											
Karlstad--------	0-15	5-15	1.20-1.45	2.00-6.00	0.13-0.18	Low------	1.0-4.0	0.24	0.24	3	3
	15-27	5-18	1.35-1.60	2.00-6.00	0.13-0.18	Low------	0.5-2.0	0.24	0.24		
	27-60	1-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.17		
1317:											
Vallers---------	0-15	28-35	1.20-1.35	0.20-0.60	0.18-0.22	Moderate	5.0-8.0	0.28	0.28	5	4L
	15-23	18-35	1.40-1.55	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.28	0.28		
	23-60	18-35	1.50-1.70	0.20-0.60	0.17-0.19	Low------	0.0-0.5	0.37	0.37		
1318:											
Darnen----------	0-56	18-27	1.25-1.40	0.60-2.00	0.18-0.20	Low------	4.0-8.0	0.24	0.24	5	6
	56-60	18-30	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.28	0.28		
1319B:											
Rockwood--------	0-4	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3
	4-14	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	14-19	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	19-30	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28		
	30-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		
1319C:											
Rockwood--------	0-7	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3
	7-16	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	16-23	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	23-31	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28		
	31-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		
1319D:											
Rockwood--------	0-2	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3
	2-15	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	15-21	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	21-32	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28		
	32-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		
1320B:											
Blowers---------	0-3	5-15	1.55-1.80	0.60-2.00	0.13-0.18	Low------	2.0-6.0	0.24	0.24	4	3
	3-14	5-10	1.60-1.80	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28		
	14-22	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.24	0.24		
	22-32	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.24	0.24		
	32-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		
1321:											
Paddock---------	0-4	8-15	1.45-1.75	0.60-2.00	0.13-0.18	Low------	2.0-6.0	0.24	0.24	4	3
	4-16	3-10	1.50-1.75	0.60-2.00	0.12-0.16	Low------	---	0.24	0.24		
	16-43	8-18	1.60-1.80	0.20-0.60	0.12-0.16	Low------	---	0.24	0.24		
	43-60	6-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24		

PHYSICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in		Pct				
1365:											
Hillview--------	0-8	5-15	1.25-1.40	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3
	8-19	3-12	1.35-1.55	2.00-6.00	0.10-0.14	Low------	0.5-1.0	0.17	0.17		
	19-28	8-18	1.35-1.55	2.00-6.00	0.12-0.19	Low------	0.5-1.0	0.24	0.24		
	28-60	3-12	1.35-1.65	2.00-6.00	0.08-0.17	Low------	0.0-0.5	0.28	0.28		
1825B:											
Seelyeville-----	0-60	---	0.10-0.25	0.20-6.00	0.35-0.45	---	25-99	0.10	0.10	3	8
1878:											
Hamre----------	0-14	---	0.18-0.22	0.20-2.00	0.35-0.48	Low------	85-95	---	---	5	2
	14-19	18-35	1.30-1.70	0.20-2.00	0.17-0.19	Moderate	4.0-10	0.32	0.32		
	19-60	18-35	1.40-1.70	0.20-2.00	0.17-0.19	Moderate	0.5-2.0	0.32	0.32		
1938:											
Lakepark--------	0-8	27-35	1.30-1.45	0.20-0.60	0.19-0.21	Low------	5.0-8.0	0.24	0.24	5	6
	8-28	20-35	1.30-1.45	0.20-0.60	0.19-0.21	Low------	1.0-3.0	0.24	0.24		
	28-34	22-35	1.40-1.50	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.32	0.32		
	34-60	22-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.32	0.32		
1942:											
Forada----------	0-10	10-22	1.00-1.40	0.60-2.00	0.20-0.22	Low------	5.0-15	0.28	0.28	4	5
	10-21	8-18	1.30-1.50	2.00-6.00	0.12-0.19	Low------	0.5-1.0	0.28	0.28		
	21-60	0-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15		
1967:											
Hamerly---------	0-9	27-35	1.20-1.50	0.60-2.00	0.17-0.22	Moderate	4.0-7.0	0.28	0.28	5	4L
	9-20	18-35	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	---	0.28	0.32		
	20-60	18-35	1.30-1.60	0.20-0.60	0.14-0.19	Moderate	---	0.37	0.37		
Vallers---------	0-15	28-35	1.20-1.35	0.20-0.60	0.18-0.22	Moderate	5.0-8.0	0.28	0.28	5	4L
	15-25	18-35	1.40-1.55	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.28	0.28		
	25-60	18-35	1.50-1.70	0.20-0.60	0.17-0.19	Low------	0.0-0.5	0.37	0.37		
1975:											
Oylen----------	0-13	7-12	1.50-1.70	2.00-6.00	0.12-0.16	Low------	2.0-4.0	0.20	0.20	3	3
	13-22	7-18	1.60-1.70	0.60-2.00	0.12-0.18	Low------	0.5-2.0	0.24	0.24		
	22-52	2-6	1.45-1.60	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10		
	52-60	0-4	1.45-1.60	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.10	0.10		
1997:											
Vallers---------	0-15	28-35	1.20-1.35	0.20-0.60	0.18-0.22	Moderate	5.0-8.0	0.28	0.28	5	4L
	15-27	18-35	1.40-1.55	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.28	0.28		
	27-60	18-35	1.50-1.70	0.20-0.60	0.17-0.19	Low------	0.0-0.5	0.37	0.37		
Hamerly---------	0-9	27-35	1.20-1.50	0.60-2.00	0.17-0.22	Moderate	4.0-7.0	0.28	0.28	5	4L
	9-21	18-35	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	---	0.28	0.32		
	21-60	18-35	1.30-1.60	0.20-0.60	0.14-0.19	Moderate	---	0.37	0.37		
Winger----------	0-22	27-35	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L
	22-35	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	0.0-0.5	0.28	0.28		
	35-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	---	0.28	0.28		

CHEMICAL PROPERTIES OF THE SOILS

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
20B:						
Chapett---------	0-8	10-20	8.0-20.0	6.1-7.3	---	---
	8-23	18-28	8.0-19.0	6.1-7.3	---	---
	23-33	10-18	4.0-12.0	7.4-8.4	15-30	---
	33-60	10-18	4.0-12.0	7.4-8.4	10-12	---
20C2:						
Chapett---------	0-9	10-20	8.0-20.0	6.1-7.3	---	---
	9-26	18-28	8.0-19.0	6.1-7.3	---	---
	26-43	10-18	4.0-12.0	7.4-8.4	15-30	---
	43-60	10-18	4.0-12.0	7.4-8.4	10-12	---
20E:						
Chapett---------	0-7	10-20	8.0-20.0	6.1-7.3	---	---
	7-20	18-28	8.0-19.0	6.1-7.3	---	---
	20-33	10-18	4.0-12.0	7.4-8.4	15-30	---
	33-60	10-18	4.0-12.0	7.4-8.4	10-12	---
26:						
Aazdahl---------	0-13	27-35	20.0-30.0	6.6-7.3	---	---
	13-19	27-35	14.0-24.0	6.6-7.8	15-30	---
	19-60	24-35	12.0-18.0	7.4-8.4	15-30	---
33B:						
Barnes----------	0-7	18-27	11.0-26.0	6.1-7.8	---	0-2
	7-13	18-27	8.0-18.0	6.1-7.8	0-5	0-2
	13-60	18-27	7.0-17.0	7.4-8.4	10-30	0-4
36:						
Flom----------	0-16	27-35	20.0-37.0	6.1-7.8	0-15	---
	16-24	24-35	10.0-23.0	6.6-8.4	0-25	---
	24-60	24-35	10.0-21.0	7.4-8.4	5-25	---
38B:						
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---
	9-20	18-35	7.0-21.0	6.1-8.4	0-30	---
	20-60	18-30	7.0-18.0	7.4-8.4	5-30	---
38C:						
Waukon----------	0-8	12-27	9.0-28.0	6.1-7.3	---	---
	8-20	18-35	7.0-21.0	6.1-8.4	0-30	---
	20-60	18-30	7.0-18.0	7.4-8.4	5-30	---
38E:						
Waukon----------	0-7	12-27	9.0-28.0	6.1-7.3	---	---
	7-26	18-35	7.0-21.0	6.1-8.4	0-30	---
	26-60	18-30	7.0-18.0	7.4-8.4	5-30	---
40B:						
Nebish----------	0-7	5-20	4.0-14.0	5.6-7.3	---	---
	7-26	22-35	10.0-18.0	5.6-7.8	---	---
	26-60	18-30	9.0-16.0	7.4-8.4	5-15	---
40C:						
Nebish----------	0-8	5-20	4.0-14.0	5.6-7.3	---	---
	8-26	22-35	10.0-18.0	5.6-7.8	---	---
	26-60	18-30	9.0-16.0	7.4-8.4	5-15	---
40E:						
Nebish----------	0-9	5-20	4.0-14.0	5.6-7.3	---	---
	9-22	22-35	10.0-18.0	5.6-7.8	---	---
	22-60	18-30	9.0-16.0	7.4-8.4	5-15	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
47:						
Colvin----------	0-10	27-34	25.0-40.0	6.6-8.4	0-10	---
	10-26	18-34	15.0-25.0	7.4-9.0	10-45	---
	26-60	18-34	10.0-20.0	7.4-8.4	5-20	---
63:						
Rockwell--------	0-18	20-30	15.0-30.0	7.4-8.4	10-20	---
	18-25	5-30	5.0-15.0	7.9-8.4	15-30	---
	25-32	3-10	2.0-6.0	7.4-7.8	10-20	---
	32-60	15-30	5.0-15.0	7.4-7.8	10-20	---
108:						
McIntosh--------	0-9	18-27	19.0-36.0	7.4-8.4	5-30	---
	9-30	18-35	15.0-38.0	7.4-8.4	20-35	---
	30-60	18-35	9.0-27.0	7.4-8.4	5-30	---
111:						
Hangaard--------	0-10	8-18	10.0-26.0	6.6-7.8	---	---
	10-18	5-15	4.0-14.0	6.6-7.8	0-5	---
	18-60	2-10	2.0-6.0	7.4-8.4	5-15	---
121:						
Wykeham---------	0-8	5-18	6.0-23.0	5.1-6.5	---	---
	8-11	5-15	4.0-13.0	5.1-6.5	---	---
	11-21	18-30	8.0-20.0	5.6-7.3	---	---
	21-60	10-18	4.0-12.0	7.4-8.4	10-25	---
125:						
Beltrami--------	0-4	6-18	8.0-22.0	6.1-7.3	---	---
	4-8	5-15	4.0-14.0	5.6-7.3	---	---
	8-22	18-35	9.0-19.0	5.6-7.8	---	---
	22-60	18-30	8.0-16.0	7.4-8.4	12-30	---
133A:						
Dalbo----------	0-6	20-27	8.0-25.0	5.6-7.3	---	---
	6-41	35-60	14.0-40.0	5.1-7.3	---	---
	41-60	24-35	10.0-22.0	7.4-8.4	5-30	---
133B:						
Dalbo----------	0-7	20-27	8.0-25.0	5.6-7.3	---	---
	7-21	35-60	14.0-40.0	5.1-7.3	---	---
	21-60	24-35	10.0-22.0	7.4-8.4	5-30	---
133C:						
Dalbo----------	0-7	20-27	8.0-25.0	5.6-7.3	---	---
	7-25	35-60	14.0-40.0	5.1-7.3	---	---
	25-60	24-35	10.0-22.0	7.4-8.4	5-30	---
133E:						
Dalbo----------	0-7	20-27	8.0-25.0	5.6-7.3	---	---
	7-29	35-60	14.0-40.0	5.1-7.3	---	---
	29-60	24-35	10.0-22.0	7.4-8.4	5-30	---
137:						
Dovray----------	0-10	40-60	30.0-50.0	6.1-7.8	---	---
	10-43	40-60	20.0-30.0	6.1-7.8	0-3	---
	43-54	40-60	20.0-30.0	6.6-7.8	0-5	---
	54-60	25-60	20.0-30.0	6.6-8.4	0-15	---
141B:						
Egeland---------	0-9	10-18	15.0-20.0	5.6-7.3	---	0-2
	9-16	10-18	15.0-20.0	6.1-7.8	---	0-2
	16-60	6-14	15.0-20.0	7.4-8.4	10-20	0-2

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
141C:						
Egeland---------	0-13	10-18	15.0-20.0	5.6-7.3	---	0-2
	13-22	10-18	15.0-20.0	6.1-7.8	---	0-2
	22-60	6-14	15.0-20.0	7.4-8.4	10-20	0-2
168B:						
Forman----------	0-8	27-30	19.0-34.0	6.6-7.8	---	0-2
	8-15	30-35	13.0-23.0	6.6-7.8	---	0-2
	15-60	18-35	7.0-22.0	7.4-8.4	15-30	0-4
168C2:						
Forman----------	0-7	27-30	19.0-34.0	6.6-7.8	---	0-2
	7-16	30-35	13.0-23.0	6.6-7.8	---	0-2
	16-60	18-35	7.0-22.0	7.4-8.4	15-30	0-4
168D2:						
Forman----------	0-8	27-30	19.0-34.0	6.6-7.8	---	0-2
	8-15	30-35	13.0-23.0	6.6-7.8	---	0-2
	15-60	18-35	7.0-22.0	7.4-8.4	15-30	0-4
168E:						
Forman----------	0-7	27-30	19.0-34.0	6.6-7.8	---	0-2
	7-15	30-35	13.0-23.0	6.6-7.8	---	0-2
	15-60	18-35	7.0-22.0	7.4-8.4	15-30	0-4
171B:						
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---
	8-14	24-35	13.0-22.0	6.6-7.8	20-30	---
	14-60	18-35	9.0-18.0	7.4-8.4	12-20	---
180:						
Gonvick---------	0-12	10-27	8.0-24.0	6.1-7.3	---	---
	12-34	22-35	12.0-24.0	6.6-7.3	0-5	---
	34-60	18-35	8.0-18.0	7.4-8.4	10-25	---
184:						
Hamerly---------	0-10	18-27	15.0-30.0	6.6-8.4	0-15	---
	10-24	18-30	8.0-20.0	7.4-8.4	15-30	---
	24-60	18-30	7.0-19.0	7.4-8.4	10-25	---
191:						
Epoufette-------	0-6	5-15	10.0-20.0	6.1-7.3	---	---
	6-12	5-15	4.0-14.0	6.1-7.3	0-5	---
	12-20	8-18	4.0-10.0	6.6-7.8	0-10	---
	20-60	0-8	1.0-5.0	7.4-8.4	5-10	---
202:						
Meehan----------	0-13	4-10	2.0-15.0	3.5-7.3	---	---
	13-25	4-9	1.0-8.0	3.5-6.5	---	---
	25-60	1-4	0.0-4.0	5.1-7.3	---	---
207D:						
Nymore----------	0-6	2-12	3.0-13.0	5.1-6.5	---	---
	6-46	0-5	0.0-5.0	5.1-7.3	---	---
	46-60	0-5	0.0-1.0	5.1-7.8	---	---
267B:						
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---
	2-16	5-15	3.0-14.0	5.1-6.5	---	---
	16-31	18-30	8.0-16.0	5.6-7.3	---	---
	31-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
267C:						
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---
	3-16	5-15	3.0-14.0	5.1-6.5	---	---
	16-28	18-30	8.0-16.0	5.6-7.3	---	---
	28-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
267E:						
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---
	2-14	5-15	3.0-14.0	5.1-6.5	---	---
	14-28	18-30	8.0-16.0	5.6-7.3	---	---
	28-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
315A:						
Bootlake--------	0-6	5-15	4.0-15.0	5.6-7.3	---	---
	6-13	2-10	1.0-10.0	5.6-7.3	---	---
	13-28	10-18	5.0-12.0	5.6-7.3	---	---
	28-60	1-5	1.0-5.0	7.4-8.4	5-20	---
315B:						
Bootlake--------	0-3	5-15	4.0-15.0	5.6-7.3	---	---
	3-9	2-10	1.0-10.0	5.6-7.3	---	---
	9-21	10-18	5.0-12.0	5.6-7.3	---	---
	21-60	1-5	1.0-5.0	7.4-8.4	5-20	---
332B:						
Sugarbush-------	0-4	5-15	4.0-12.0	5.6-7.3	---	---
	4-13	2-10	2.0-8.0	5.6-7.3	---	---
	13-18	10-18	5.0-10.0	5.6-7.3	---	---
	18-60	1-5	1.0-5.0	7.4-8.4	5-15	---
335:						
Urness----------	0-7	18-27	40.0-50.0	7.4-8.4	5-25	---
	7-60	18-35	40.0-50.0	7.4-8.4	5-25	---
339:						
Fordville-------	0-10	18-25	21.0-27.0	6.1-7.3	0-1	0-2
	10-17	18-30	21.0-27.0	6.1-7.8	2-15	0-2
	17-28	15-30	15.0-25.0	6.1-8.4	2-20	0-2
	28-60	0-5	1.0-10.0	7.4-8.4	2-20	0-2
344:						
Quam----------	0-10	28-35	25.0-45.0	6.6-7.8	---	---
	10-42	22-35	20.0-40.0	6.6-7.8	0-15	---
	42-60	20-35	12.0-25.0	7.4-8.4	5-20	---
351:						
Colvin----------	0-12	27-34	25.0-40.0	6.6-8.4	0-10	---
	12-45	18-34	15.0-25.0	7.4-8.4	10-45	---
	45-60	18-34	10.0-20.0	7.4-8.4	5-20	---
375:						
Forada----------	0-14	10-22	14.0-30.0	6.1-7.8	0-15	---
	14-22	8-18	4.0-12.0	6.1-7.8	0-15	---
	22-60	0-5	0.0-5.0	6.6-8.4	0-10	---
398:						
Winger----------	0-13	27-35	27.0-38.0	7.4-8.4	5-20	---
	13-37	18-35	9.0-18.0	7.4-8.4	15-35	---
	37-60	18-32	9.0-16.0	7.4-8.4	15-30	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
406A:						
Dorset----------	0-9	4-18	10.0-23.0	5.6-7.3	---	---
	9-21	10-18	7.0-17.0	5.6-7.3	---	---
	21-60	0-5	0.0-5.0	7.4-8.4	5-15	---
406B:						
Dorset----------	0-10	4-18	10.0-23.0	5.6-7.3	---	---
	10-17	10-18	7.0-17.0	5.6-7.3	---	---
	17-29	5-10	3.0-8.0	7.4-8.4	10-25	---
	29-60	0-5	0.0-5.0	7.4-8.4	5-15	---
413:						
Osakis----------	0-8	8-18	12.0-19.0	6.1-7.3	---	---
	8-18	8-18	9.0-13.0	6.1-7.3	---	---
	18-60	0-5	0.0-4.0	7.4-8.4	5-30	---
418:						
Lamoure---------	0-39	27-34	25.0-32.0	7.4-8.4	0-10	0-4
	39-60	20-34	16.0-23.0	7.4-8.4	4-20	0-4
422B:						
Bygland---------	0-8	27-40	20.0-40.0	6.1-7.3	---	---
	8-22	35-60	15.0-30.0	6.1-7.8	0-5	---
	22-38	18-40	10.0-25.0	7.4-8.4	10-20	---
	38-60	18-40	10.0-20.0	7.4-8.4	5-15	---
422C:						
Bygland---------	0-8	27-40	20.0-40.0	6.1-7.3	---	---
	8-16	35-60	15.0-30.0	6.1-7.8	0-5	---
	16-25	18-40	10.0-25.0	7.4-8.4	10-20	---
	25-60	18-40	10.0-20.0	7.4-8.4	5-15	---
503B:						
Balmlake--------	0-3	3-12	5.0-10.0	5.1-6.5	---	---
	3-20	3-12	3.0-7.0	5.1-6.5	---	---
	20-28	8-18	5.0-10.0	5.6-6.5	---	---
	28-60	6-14	4.0-8.0	7.4-8.4	---	---
503C:						
Balmlake--------	0-2	3-12	5.0-10.0	5.1-6.5	---	---
	2-17	3-12	3.0-7.0	5.1-6.5	---	---
	17-29	8-18	5.0-10.0	5.6-6.5	---	---
	29-60	6-14	4.0-8.0	7.4-8.4	---	---
503E:						
Balmlake--------	0-2	3-12	5.0-10.0	5.1-6.5	---	---
	2-15	3-12	3.0-7.0	5.1-6.5	---	---
	15-28	8-18	5.0-10.0	5.6-6.5	---	---
	28-60	6-14	4.0-8.0	7.4-8.4	---	---
508:						
Wyndmere--------	0-14	5-15	20.0-40.0	7.4-8.4	10-25	---
	14-24	0-10	10.0-20.0	7.4-8.4	15-40	0-2
	24-60	0-10	5.0-15.0	7.4-8.4	5-25	0-2
540:						
Seelyeville-----	0-24	---	140-200	4.5-7.3	---	---
	24-60	---	140-200	4.5-7.3	---	---
541:						
Rifle----------	0-14	---	150-180	4.5-7.3	---	---
	14-60	---	50-150	4.5-7.3	---	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
544:						
Cathro----------	0-8	---	120-170	4.5-7.8	---	---
	8-22	---	120-170	4.5-7.8	---	---
	22-60	10-30	2.0-25.0	6.6-8.4	5-25	---
564:						
Friendship------	0-3	3-8	2.0-10.0	4.5-7.3	---	---
	3-31	0-4	0.0-4.0	4.5-7.3	---	---
	31-60	0-4	0.0-4.0	5.1-7.8	---	---
567A:						
Verndale--------	0-8	7-12	7.0-15.0	5.6-7.3	---	---
	8-15	7-18	3.0-12.0	5.6-7.3	---	---
	15-33	2-6	2.0-4.0	5.6-7.3	---	---
	33-60	0-4	0.0-3.0	6.1-8.4	0-30	---
567B:						
Verndale--------	0-7	7-12	7.0-15.0	5.6-7.3	---	---
	7-13	7-18	3.0-12.0	5.6-7.3	---	---
	13-31	2-6	2.0-4.0	5.6-7.3	---	---
	31-60	0-4	0.0-3.0	6.1-8.4	0-30	---
579C2:						
Formdale--------	0-7	27-35	17.0-28.0	6.1-7.3	---	---
	7-11	24-35	13.0-22.0	6.6-7.8	20-30	---
	11-60	18-35	9.0-18.0	7.4-8.4	12-20	---
Langhei---------	0-7	28-35	10.0-30.0	6.6-8.4	0-30	---
	7-13	28-35	10.0-25.0	7.4-8.4	20-35	---
	13-60	28-35	10.0-25.0	7.4-8.4	15-30	---
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---
	8-18	0-5	1.0-6.0	7.4-8.4	10-25	---
	18-60	0-5	1.0-4.0	7.4-8.4	5-10	---
624:						
Rosy----------	0-20	3-12	1.0-15.0	5.1-7.3	---	---
	20-26	8-18	4.0-10.0	5.1-7.3	---	---
	26-60	6-18	3.0-10.0	5.6-8.4	0-30	---
701:						
Runeberg--------	0-10	10-25	12.0-40.0	6.1-7.3	---	---
	10-36	10-18	4.0-14.0	6.1-7.3	---	---
	36-60	6-15	2.0-9.0	7.4-8.4	---	---
711B:						
Arvilla---------	0-8	6-18	5.0-20.0	6.1-8.4	---	---
	8-15	6-18	5.0-15.0	6.6-8.4	---	---
	15-60	2-10	1.0-5.0	7.4-8.4	1-5	---
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---
	8-15	0-10	1.0-6.0	6.1-7.8	0-5	---
	15-36	0-5	1.0-6.0	7.4-8.4	10-25	---
	36-60	0-5	1.0-4.0	7.4-8.4	5-10	---
711C:						
Arvilla---------	0-8	6-18	5.0-20.0	6.1-8.4	---	---
	8-15	6-18	5.0-15.0	6.6-8.4	---	---
	15-60	2-10	1.0-5.0	7.4-8.4	1-5	---
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---
	8-15	0-5	1.0-6.0	7.4-8.4	10-25	---
	15-60	0-5	1.0-4.0	7.4-8.4	5-10	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
718B:						
Naytahwaush-----	0-4	10-20	15.0-28.0	5.6-7.3	---	---
	4-7	8-15	6.0-18.0	5.6-7.3	---	---
	7-30	35-60	15.0-26.0	5.6-7.3	0-5	---
	30-60	22-35	9.0-22.0	7.4-8.4	15-25	---
718C:						
Naytahwaush-----	0-4	10-20	15.0-28.0	5.6-7.3	---	---
	4-6	8-15	6.0-18.0	5.6-7.3	---	---
	6-23	35-60	15.0-26.0	5.6-7.3	0-5	---
	23-60	22-35	9.0-22.0	7.4-8.4	15-25	---
718E:						
Naytahwaush-----	0-3	10-20	15.0-28.0	5.6-7.3	---	---
	3-7	8-15	6.0-18.0	5.6-7.3	---	---
	7-23	35-60	15.0-26.0	5.6-7.3	0-5	---
	23-60	22-35	9.0-22.0	7.4-8.4	15-25	---
721E:						
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---
	7-60	0-5	0.0-3.0	7.4-8.4	5-30	---
746:						
Haslie----------	0-8	---	140-180	5.6-7.8	---	---
	8-43	---	140-190	5.6-7.8	---	---
	43-60	18-35	10.0-45.0	7.4-8.4	20-80	---
747B:						
Audubon---------	0-9	40-60	25.0-45.0	6.6-7.8	---	---
	9-29	35-60	19.0-37.0	7.4-8.4	15-30	---
	29-60	35-60	18.0-35.0	7.4-8.4	10-25	---
753D:						
Abbeylake-------	0-8	2-10	3.0-15.0	6.1-7.3	0-15	---
	8-24	0-10	1.0-8.0	6.1-7.3	0-15	---
	24-60	0-3	1.0-5.0	7.4-8.4	5-30	---
753E:						
Abbeylake-------	0-3	2-10	3.0-15.0	6.1-7.3	0-15	---
	3-21	0-10	1.0-8.0	6.1-7.3	0-15	---
	21-60	0-3	1.0-5.0	7.4-8.4	5-30	---
765:						
Smiley----------	0-13	8-20	7.0-22.0	6.6-7.8	0-15	---
	13-26	18-35	8.0-25.0	6.6-8.4	0-30	---
	26-47	16-32	8.0-25.0	7.9-8.4	10-30	---
	47-60	16-32	5.0-20.0	7.4-8.4	5-25	---
767:						
Auganaush-------	0-5	12-27	15.0-30.0	5.6-7.3	---	---
	5-8	5-18	5.0-15.0	5.6-7.3	---	---
	8-22	35-60	15.0-30.0	5.6-7.3	---	---
	22-60	30-45	15.0-25.0	7.4-8.4	15-30	---
775B:						
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-13	2-10	2.0-8.0	5.6-7.3	---	---
	13-25	10-18	5.0-10.0	5.6-7.3	---	---
	25-60	1-5	1.0-5.0	7.4-8.4	5-15	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
775B:						
Two Inlets------	0-4	2-10	2.0-8.0	5.6-7.3	---	---
	4-13	2-10	1.0-6.0	5.6-7.3	---	---
	13-27	5-15	2.0-9.0	6.1-7.3	---	---
	27-60	0-3	0.0-2.0	7.4-8.4	5-30	---
775C:						
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-10	2-10	2.0-8.0	5.6-7.3	---	---
	10-22	10-18	5.0-10.0	5.6-7.3	---	---
	22-60	1-5	1.0-5.0	7.4-8.4	5-15	---
Two Inlets------	0-2	2-10	2.0-8.0	5.6-7.3	---	---
	2-10	2-10	1.0-6.0	5.6-7.3	---	---
	10-27	5-15	2.0-9.0	6.1-7.3	---	---
	27-60	0-3	0.0-2.0	7.4-8.4	5-30	---
776B:						
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---
	3-12	5-15	3.0-14.0	5.1-6.5	---	---
	12-32	18-30	8.0-16.0	5.6-7.3	---	---
	32-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-17	2-10	2.0-8.0	5.6-7.3	---	---
	17-28	10-18	5.0-10.0	5.6-7.3	---	---
	28-60	1-5	1.0-5.0	7.4-8.4	5-15	---
776C:						
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---
	2-16	5-15	3.0-14.0	5.1-6.5	---	---
	16-32	18-30	8.0-16.0	5.6-7.3	---	---
	32-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-14	2-10	2.0-8.0	5.6-7.3	---	---
	14-21	10-18	5.0-10.0	5.6-7.3	---	---
	21-60	1-5	1.0-5.0	7.4-8.4	5-15	---
776E:						
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---
	3-14	5-15	3.0-14.0	5.1-6.5	---	---
	14-26	18-30	8.0-16.0	5.6-7.3	---	---
	26-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-10	2-10	2.0-8.0	5.6-7.3	---	---
	10-19	10-18	5.0-10.0	5.6-7.3	---	---
	19-60	1-5	1.0-5.0	7.4-8.4	5-15	---
778B:						
Dorset----------	0-10	4-18	10.0-23.0	5.6-7.3	---	---
	10-20	10-18	7.0-17.0	5.6-7.3	---	---
	20-24	5-10	3.0-8.0	7.4-8.4	10-25	---
	24-60	0-5	0.0-5.0	7.4-8.4	5-15	---
Corliss---------	0-5	2-10	3.0-12.0	6.1-7.8	0-15	---
	5-13	0-10	1.0-6.0	6.1-7.8	0-15	---
	13-60	0-5	0.0-3.0	7.4-8.4	5-30	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
778C:						
Dorset----------	0-9	4-18	10.0-23.0	5.6-7.3	---	---
	9-15	10-18	7.0-17.0	5.6-7.3	---	---
	15-18	5-10	3.0-8.0	7.4-8.4	10-25	---
	18-60	0-5	0.0-5.0	7.4-8.4	5-15	---
Corliss---------	0-5	2-10	3.0-12.0	6.1-7.8	0-15	---
	5-60	0-5	0.0-3.0	7.4-8.4	5-30	---
780B:						
Audubon---------	0-9	40-60	25.0-45.0	6.6-7.8	---	---
	9-27	35-60	19.0-37.0	7.4-8.4	15-30	---
	27-60	35-60	18.0-35.0	7.4-8.4	10-25	---
Boyerlake-------	0-9	35-40	16.0-36.0	7.4-8.4	5-20	---
	9-17	35-60	15.0-32.0	7.4-8.4	15-25	---
	17-60	35-60	14.0-31.0	7.4-8.4	10-20	---
780C2:						
Audubon---------	0-10	40-60	25.0-45.0	6.6-7.8	---	---
	10-20	35-60	19.0-37.0	7.4-8.4	15-30	---
	20-60	35-60	18.0-35.0	7.4-8.4	10-25	---
Boyerlake-------	0-9	35-40	16.0-36.0	7.4-8.4	5-20	---
	9-19	35-60	15.0-32.0	7.4-8.4	15-25	---
	19-60	35-60	14.0-31.0	7.4-8.4	10-20	---
780D2:						
Audubon---------	0-10	40-60	25.0-45.0	6.6-7.8	---	---
	10-22	35-60	19.0-37.0	7.4-8.4	15-30	---
	22-60	35-60	18.0-35.0	7.4-8.4	10-25	---
Boyerlake-------	0-7	35-40	16.0-36.0	7.4-8.4	5-20	---
	7-37	35-60	15.0-32.0	7.4-8.4	15-25	---
	37-60	35-60	14.0-31.0	7.4-8.4	10-20	---
785:						
Hamerly---------	0-8	27-35	---	6.6-8.4	---	---
	8-33	18-35	---	7.4-8.4	---	---
	33-60	18-35	---	7.4-8.4	---	---
Winger----------	0-15	27-35	---	7.4-8.4	---	---
	15-22	18-35	---	7.4-8.4	---	---
	22-60	18-32	---	7.4-8.4	---	---
786:						
Winger----------	0-14	27-35	---	7.4-8.4	---	---
	14-33	18-35	---	7.4-8.4	---	---
	33-60	18-32	---	7.4-8.4	---	---
Hamerly---------	0-9	27-35	---	6.6-8.4	---	---
	9-18	18-35	---	7.4-8.4	---	---
	18-60	18-35	---	7.4-8.4	---	---
Colvin----------	0-15	27-34	25.0-40.0	6.6-8.4	0-10	---
	15-38	18-34	15.0-25.0	7.4-8.4	10-45	---
	38-60	18-34	10.0-20.0	7.4-8.4	5-20	---
797:						
Mooselake-------	0-15	---	---	4.5-7.3	---	---
	15-60	---	---	4.5-7.3	---	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
797:						
Lupton----------	0-15	---	100-200	4.5-7.8	---	---
	15-60	---	100-200	4.5-7.8	---	---
867B:						
Graycalm--------	0-6	0-10	4.0-12.0	4.5-6.5	---	---
	6-21	0-15	2.0-4.0	4.5-7.3	---	---
	21-46	0-10	1.0-5.0	4.5-7.3	---	---
	46-60	0-10	0.0-2.0	5.6-8.4	---	---
Menahga---------	0-3	2-10	2.0-10.0	4.5-6.5	---	---
	3-42	0-5	1.0-4.0	4.5-6.5	---	---
	42-60	0-5	1.0-4.0	5.6-7.8	---	---
867C:						
Graycalm--------	0-6	0-10	4.0-12.0	4.5-6.5	---	---
	6-26	0-15	2.0-4.0	4.5-7.3	---	---
	26-55	0-10	1.0-5.0	4.5-7.3	---	---
	55-60	0-10	0.0-2.0	5.6-8.4	---	---
Menahga---------	0-2	2-10	2.0-10.0	4.5-6.5	---	---
	2-40	0-5	1.0-4.0	4.5-6.5	---	---
	40-60	0-5	1.0-4.0	5.6-7.8	---	---
867E:						
Graycalm--------	0-3	0-10	4.0-12.0	4.5-6.5	---	---
	3-37	0-15	2.0-4.0	4.5-7.3	---	---
	37-60	0-10	1.0-5.0	4.5-7.3	---	---
Menahga---------	0-12	2-10	2.0-10.0	4.5-6.5	---	---
	12-52	0-5	1.0-4.0	4.5-6.5	---	---
	52-60	0-5	1.0-4.0	5.6-7.8	---	---
903B:						
Barnes----------	0-9	18-27	11.0-26.0	6.1-7.8	---	0-2
	9-19	18-27	8.0-18.0	6.1-7.8	0-5	0-2
	19-60	18-27	7.0-17.0	7.4-8.4	10-30	0-4
Langhei---------	0-6	18-27	10.0-30.0	6.6-8.4	0-30	---
	6-17	18-32	10.0-25.0	7.9-8.4	20-35	---
	17-60	18-32	10.0-25.0	7.4-8.4	15-30	---
903C2:						
Barnes----------	0-8	18-27	11.0-26.0	6.1-7.8	---	0-2
	8-19	18-27	8.0-18.0	6.1-7.8	0-5	0-2
	19-60	18-27	7.0-17.0	7.4-8.4	10-30	0-4
Langhei---------	0-7	18-27	10.0-30.0	6.6-8.4	0-30	---
	7-16	18-32	10.0-25.0	7.9-8.4	20-35	---
	16-60	18-32	10.0-25.0	7.4-8.4	15-30	---
931C2:						
Formdale--------	0-7	27-35	17.0-28.0	6.1-7.3	---	---
	7-15	24-35	13.0-22.0	6.6-7.8	20-30	---
	15-60	18-35	9.0-18.0	7.4-8.4	12-20	---
Langhei---------	0-8	28-35	10.0-30.0	6.6-8.4	0-30	---
	8-19	28-35	10.0-25.0	7.4-8.4	20-35	---
	19-60	28-35	10.0-25.0	7.4-8.4	15-30	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
942D2:						
Langhei---------	0-7	18-27	10.0-30.0	6.6-8.4	0-30	---
	7-11	18-32	10.0-25.0	7.9-8.4	20-35	---
	11-60	18-32	10.0-25.0	7.4-8.4	15-30	---
Barnes----------	0-7	18-27	11.0-26.0	6.1-7.8	---	0-2
	7-15	18-27	8.0-18.0	6.1-7.8	0-5	0-2
	15-60	18-27	7.0-17.0	7.4-8.4	10-30	0-4
943D2:						
Langhei---------	0-6	28-35	10.0-30.0	6.6-8.4	0-30	---
	6-13	28-35	10.0-25.0	7.4-8.4	20-35	---
	13-60	28-35	10.0-25.0	7.4-8.4	15-30	---
Formdale--------	0-7	27-35	17.0-28.0	6.1-7.3	---	---
	7-14	24-35	13.0-22.0	6.6-7.8	20-30	---
	14-60	18-35	9.0-18.0	7.4-8.4	12-20	---
943E:						
Langhei---------	0-8	28-35	10.0-30.0	6.6-8.4	0-30	---
	8-60	28-35	10.0-25.0	7.4-8.4	20-35	---
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---
	8-16	24-35	13.0-22.0	6.6-7.8	20-30	---
	16-60	18-35	9.0-18.0	7.4-8.4	12-20	---
951B:						
Nebish----------	0-2	5-20	4.0-14.0	5.6-7.3	---	---
	2-7	5-12	3.0-8.0	5.6-7.3	---	---
	7-26	22-35	10.0-18.0	5.6-7.8	---	---
	26-60	18-30	9.0-16.0	7.4-8.4	5-15	---
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-9	2-10	2.0-8.0	5.6-7.3	---	---
	9-17	10-18	5.0-10.0	5.6-7.3	---	---
	17-60	1-5	1.0-5.0	7.4-8.4	5-15	---
951C:						
Nebish----------	0-3	5-20	4.0-14.0	5.6-7.3	---	---
	3-11	5-12	3.0-8.0	5.6-7.3	---	---
	11-26	22-35	10.0-18.0	5.6-7.8	---	---
	26-60	18-30	9.0-16.0	7.4-8.4	5-15	---
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-9	2-10	2.0-8.0	5.6-7.3	---	---
	9-15	10-18	5.0-10.0	5.6-7.3	---	---
	15-60	1-5	1.0-5.0	7.4-8.4	5-15	---
951E:						
Nebish----------	0-3	5-20	4.0-14.0	5.6-7.3	---	---
	3-11	5-12	3.0-8.0	5.6-7.3	---	---
	11-27	22-35	10.0-18.0	5.6-7.8	---	---
	27-60	18-30	9.0-16.0	7.4-8.4	5-15	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-8	2-10	2.0-8.0	5.6-7.3	---	---
	8-16	10-18	5.0-10.0	5.6-7.3	---	---
	16-60	1-5	1.0-5.0	7.4-8.4	5-15	---
1015:						
Udipsamments----	0-14	1-15	1.0-5.0	6.6-7.3	---	---
	14-60	1-10	1.0-3.0	6.6-7.3	---	---
	60-80	1-10	1.0-3.0	7.4-8.4	0-5	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1016:						
Udorthents------	0-60	---	---	---	---	---
	60-80	---	---	---	---	---
1027:						
Udorthents.						
1030:						
Pits.						
Udipsamments----	0-14	1-15	1.0-5.0	6.6-7.3	---	---
	14-60	1-10	1.0-3.0	6.6-7.3	---	---
	60-80	1-10	1.0-3.0	7.4-8.4	0-5	---
1104B:						
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---
	9-17	18-35	7.0-21.0	6.1-8.4	0-30	---
	17-60	18-30	7.0-18.0	7.4-8.4	5-30	---
Dorset----------	0-8	4-18	10.0-23.0	5.6-7.3	---	---
	8-14	10-18	7.0-17.0	5.6-7.3	---	---
	14-60	0-5	0.0-5.0	7.4-8.4	5-15	---
1104C:						
Waukon----------	0-8	12-27	9.0-28.0	6.1-7.3	---	---
	8-21	18-35	7.0-21.0	6.1-8.4	0-30	---
	21-60	18-30	7.0-18.0	7.4-8.4	5-30	---
Dorset----------	0-7	4-18	10.0-23.0	5.6-7.3	---	---
	7-16	10-18	7.0-17.0	5.6-7.3	---	---
	16-60	0-5	0.0-5.0	7.4-8.4	5-15	---
1111:						
Nidaros---------	0-24	---	110-170	4.5-7.8	---	---
	24-38	8-35	13.0-51.0	5.6-8.4	---	---
	38-60	0-4	1.0-3.0	5.6-8.4	0-5	---
1113:						
Haslie----------	0-20	---	140-180	5.6-7.8	---	---
	20-60	18-35	10.0-45.0	7.4-8.4	60-80	---
Seelyeville-----	0-18	---	140-200	4.5-7.3	---	---
	18-60	---	140-200	4.5-7.3	---	---
Cathro----------	0-23	---	150-230	4.5-7.8	---	---
	23-60	10-30	2.0-20.0	5.6-8.4	5-25	---
1125B:						
Sverdrup--------	0-10	10-18	8.0-20.0	6.1-7.3	---	---
	10-25	6-18	4.0-17.0	6.1-7.8	0-15	---
	25-60	0-10	0.0-6.0	7.4-8.4	5-30	---
Abbeylake-------	0-9	2-10	3.0-15.0	6.1-7.3	0-15	---
	9-28	0-10	1.0-8.0	6.1-7.3	0-15	---
	28-60	0-3	1.0-5.0	7.4-8.4	5-30	---
1125C:						
Sverdrup--------	0-10	10-18	8.0-20.0	6.1-7.3	---	---
	10-41	6-18	4.0-17.0	6.1-7.8	0-15	---
	41-60	0-10	0.0-6.0	7.4-8.4	5-30	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1125C:						
Abbeylake-------	0-9	2-10	3.0-15.0	6.1-7.3	0-15	---
	9-26	0-10	1.0-8.0	6.1-7.3	0-15	---
	26-60	0-3	1.0-5.0	7.4-8.4	5-30	---
1126B:						
Verndale--------	0-8	7-12	7.0-15.0	5.6-7.3	---	---
	8-15	7-18	3.0-12.0	5.6-7.3	---	---
	15-47	2-6	2.0-4.0	5.6-7.3	---	---
	47-60	0-4	0.0-3.0	6.1-8.4	0-30	---
Nymore----------	0-7	2-12	3.0-13.0	5.1-6.5	---	---
	7-41	0-5	0.0-5.0	5.1-7.3	---	---
	41-60	0-5	0.0-1.0	5.1-7.8	---	---
1127A:						
Bootlake--------	0-7	5-15	4.0-15.0	5.6-7.3	---	---
	7-13	2-10	1.0-10.0	5.6-7.3	---	---
	13-18	10-18	5.0-12.0	5.6-7.3	---	---
	18-60	1-5	1.0-5.0	7.4-8.4	5-20	---
Graycalm--------	0-7	0-10	4.0-12.0	4.5-6.5	---	---
	7-22	0-15	2.0-4.0	4.5-7.3	---	---
	22-56	0-10	1.0-5.0	4.5-7.3	---	---
	56-60	0-10	0.0-2.0	5.6-8.4	---	---
1127B:						
Bootlake--------	0-6	5-15	4.0-15.0	5.6-7.3	---	---
	6-10	2-10	1.0-10.0	5.6-7.3	---	---
	10-16	10-18	5.0-12.0	5.6-7.3	---	---
	16-60	1-5	1.0-5.0	7.4-8.4	5-20	---
Graycalm--------	0-6	0-10	4.0-12.0	4.5-6.5	---	---
	6-37	0-15	2.0-4.0	4.5-7.3	---	---
	37-60	0-10	1.0-5.0	4.5-7.3	---	---
1128:						
Cathro----------	0-8	---	100-190	4.5-6.5	---	---
	8-22	---	100-190	4.5-6.5	---	---
	22-60	6-30	0.0-10.0	5.6-8.4	---	---
1129:						
Lindaas---------	0-14	27-35	24.0-42.0	6.6-7.3	---	---
	14-29	35-60	25.0-54.0	6.6-7.3	---	---
	29-60	25-40	16.0-34.0	7.4-8.4	20-30	---
1130:						
Wolverton-------	0-8	10-20	20.0-40.0	7.4-8.4	15-25	---
	8-12	5-15	20.0-40.0	7.4-8.4	15-25	---
	12-41	2-10	15.0-30.0	7.4-8.4	10-20	---
	41-60	18-35	10.0-20.0	7.4-8.4	10-20	---
1131B:						
Verndale--------	0-12	7-12	7.0-15.0	5.6-7.3	---	---
	12-16	7-18	3.0-12.0	5.6-7.3	---	---
	16-35	2-6	2.0-4.0	5.6-7.3	---	---
	35-60	0-4	0.0-3.0	6.1-8.4	0-30	---
Abbeylake-------	0-7	2-10	3.0-15.0	6.1-7.3	0-15	---
	7-22	0-10	1.0-8.0	6.1-7.3	0-15	---
	22-60	0-3	1.0-5.0	7.4-8.4	5-30	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1132B:						
Eagleview--------	0-9	2-10	10.0-15.0	5.6-7.3	---	---
	9-28	2-10	10.0-15.0	5.6-7.3	---	---
	28-48	2-10	5.0-10.0	6.1-7.3	---	---
Balmlake---------	0-7	3-12	5.0-10.0	5.1-6.5	---	---
	7-17	3-12	3.0-7.0	5.1-6.5	---	---
	17-24	8-18	5.0-10.0	5.6-6.5	---	---
	24-60	6-14	4.0-8.0	7.4-8.4	---	---
1132C:						
Eagleview--------	0-7	2-10	10.0-15.0	5.6-7.3	---	---
	7-23	2-10	10.0-15.0	5.6-7.3	---	---
	23-37	2-10	5.0-10.0	6.1-7.3	---	---
	37-60	2-10	0.0-5.0	6.1-8.4	0-10	---
Balmlake---------	0-3	3-12	5.0-10.0	5.1-6.5	---	---
	3-22	3-12	3.0-7.0	5.1-6.5	---	---
	22-29	8-18	5.0-10.0	5.6-6.5	---	---
	29-60	6-14	4.0-8.0	7.4-8.4	---	---
1132E:						
Eagleview--------	0-3	2-10	10.0-15.0	5.6-7.3	---	---
	3-15	2-10	10.0-15.0	5.6-7.3	---	---
	15-46	2-10	5.0-10.0	6.1-7.3	---	---
	46-60	2-10	0.0-5.0	6.1-8.4	0-10	---
Balmlake---------	0-3	3-12	5.0-10.0	5.1-6.5	---	---
	3-17	3-12	3.0-7.0	5.1-6.5	---	---
	17-27	8-18	5.0-10.0	5.6-6.5	---	---
	27-60	6-14	4.0-8.0	7.4-8.4	---	---
1135:						
Foxlake----------	0-19	35-60	25.0-50.0	6.6-7.8	0-20	---
	19-38	35-60	18.0-40.0	6.6-7.8	0-30	---
	38-49	35-60	18.0-40.0	7.4-8.4	20-30	---
	49-60	35-60	18.0-40.0	7.4-8.4	10-20	---
1136:						
Nidaros----------	0-31	---	110-170	4.5-7.8	---	---
	31-49	8-35	13.0-51.0	5.6-8.4	---	---
	49-60	0-4	1.0-3.0	5.6-8.4	0-5	---
1137B:						
Birchlake--------	0-8	30-40	21.0-30.0	6.1-7.3	---	---
	8-27	35-60	19.0-40.0	6.1-7.3	---	---
	27-60	30-40	15.0-21.0	7.4-8.4	15-30	---
	40-80	30-40	15.0-21.0	7.4-8.4	10-20	---
1137C:						
Birchlake--------	0-8	30-40	21.0-30.0	6.1-7.3	---	---
	8-17	35-60	19.0-40.0	6.1-7.3	---	---
	17-60	30-40	15.0-21.0	7.4-8.4	15-30	---
	40-80	30-40	15.0-21.0	7.4-8.4	10-20	---
1137D:						
Birchlake--------	0-7	30-40	21.0-30.0	6.1-7.3	---	---
	7-15	35-60	19.0-40.0	6.1-7.3	---	---
	15-60	30-40	15.0-21.0	7.4-8.4	15-30	---
	40-80	30-40	15.0-21.0	7.4-8.4	10-20	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1137E:						
Birchlake--------	0-7	30-40	21.0-30.0	6.1-7.3	---	---
	7-16	35-60	19.0-40.0	6.1-7.3	---	---
	16-60	30-40	15.0-21.0	7.4-8.4	15-30	---
	40-80	30-40	15.0-21.0	7.4-8.4	10-20	---
1138:						
Rushlake---------	0-7	3-10	2.0-12.0	6.1-7.8	0-15	---
	7-60	1-10	1.0-6.0	7.4-8.4	5-30	---
Hangaard---------	0-13	8-18	10.0-26.0	6.6-7.8	---	---
	13-60	2-10	2.0-6.0	7.4-8.4	5-15	---
1140B:						
Eagleview--------	0-9	2-10	10.0-15.0	5.6-7.3	---	---
	9-22	2-10	10.0-15.0	5.6-7.3	---	---
	22-40	2-10	5.0-10.0	6.1-7.3	---	---
	40-60	2-10	0.0-5.0	6.1-8.4	0-10	---
Snellman---------	0-7	5-18	4.0-16.0	5.1-6.5	---	---
	7-18	5-15	3.0-14.0	5.1-6.5	---	---
	18-34	18-30	8.0-16.0	5.6-7.3	---	---
	34-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
1140C:						
Eagleview--------	0-10	2-10	10.0-15.0	5.6-7.3	---	---
	10-30	2-10	10.0-15.0	5.6-7.3	---	---
	30-49	2-10	5.0-10.0	6.1-7.3	---	---
	49-60	2-10	0.0-5.0	6.1-8.4	0-10	---
Snellman---------	0-3	5-18	4.0-16.0	5.1-6.5	---	---
	3-11	5-15	3.0-14.0	5.1-6.5	---	---
	11-21	18-30	8.0-16.0	5.6-7.3	---	---
	21-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
1149:						
Hamerly----------	0-10	27-35	---	6.6-8.4	---	---
	10-26	18-35	---	7.4-8.4	---	---
	26-60	18-35	---	7.4-8.4	---	---
1195B:						
Sybil-----------	0-5	3-10	3.0-10.0	5.6-7.3	---	---
	5-10	3-15	1.0-10.0	5.6-7.3	---	---
	10-15	8-18	4.0-13.0	5.6-7.3	---	---
	15-32	3-10	1.0-7.0	5.6-7.3	---	---
	32-60	2-5	1.0-4.0	6.1-8.4	0-3	---
Eagleview--------	0-7	2-10	10.0-15.0	5.6-7.3	---	---
	7-19	2-10	10.0-15.0	5.6-7.3	---	---
	19-33	2-10	5.0-10.0	6.1-7.3	---	---
	33-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1195C:						
Sybil-----------	0-8	3-10	3.0-10.0	5.6-7.3	---	---
	8-17	3-15	1.0-10.0	5.6-7.3	---	---
	17-26	8-18	4.0-13.0	5.6-7.3	---	---
	26-37	3-10	1.0-7.0	5.6-7.3	---	---
	37-60	2-5	1.0-4.0	6.1-8.4	0-3	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1195C:						
Eagleview-------	0-4	2-10	10.0-15.0	5.6-7.3	---	---
	4-15	2-10	10.0-15.0	5.6-7.3	---	---
	15-28	2-10	5.0-10.0	6.1-7.3	---	---
	28-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1195E:						
Sybil----------	0-4	5-18	6.0-19.0	5.6-7.3	---	---
	4-15	3-15	1.0-10.0	5.6-7.3	---	---
	15-19	8-18	4.0-13.0	5.6-7.3	---	---
	19-25	3-10	1.0-7.0	5.6-7.3	---	---
	25-60	2-5	1.0-4.0	6.1-8.4	0-3	---
Eagleview-------	0-5	2-10	10.0-15.0	5.6-7.3	---	---
	5-22	2-10	10.0-15.0	5.6-7.3	---	---
	22-39	2-10	5.0-10.0	6.1-7.3	---	---
	39-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1196B:						
Lida----------	0-9	5-18	6.0-19.0	5.6-7.3	---	---
	9-13	3-15	1.0-10.0	5.6-7.3	---	---
	13-25	8-18	4.0-13.0	5.6-7.3	---	---
	25-45	1-5	1.0-4.0	5.6-7.3	---	---
	45-60	1-5	1.0-4.0	7.4-8.4	3-15	---
Two Inlets------	0-7	5-10	3.0-10.0	5.6-7.3	---	---
	7-14	2-10	1.0-6.0	5.6-7.3	---	---
	14-29	5-15	2.0-9.0	6.1-7.3	---	---
	29-60	0-3	0.0-2.0	7.4-8.4	5-30	---
1196C:						
Lida----------	0-8	5-18	6.0-19.0	5.6-7.3	---	---
	8-17	3-15	1.0-10.0	5.6-7.3	---	---
	17-25	8-18	4.0-13.0	5.6-7.3	---	---
	25-41	1-5	1.0-4.0	5.6-7.3	---	---
	41-60	1-5	1.0-4.0	7.4-8.4	3-15	---
Two Inlets------	0-4	5-10	3.0-10.0	5.6-7.3	---	---
	4-9	2-10	1.0-6.0	5.6-7.3	---	---
	9-38	5-15	2.0-9.0	6.1-7.3	---	---
	38-60	0-3	0.0-2.0	7.4-8.4	5-30	---
1196E:						
Lida----------	0-3	5-18	6.0-19.0	5.6-7.3	---	---
	3-14	3-15	1.0-10.0	5.6-7.3	---	---
	14-20	8-18	4.0-13.0	5.6-7.3	---	---
	20-27	1-5	1.0-4.0	5.6-7.3	---	---
	27-60	1-5	1.0-4.0	7.4-8.4	3-15	---
Two Inlets------	0-3	5-10	3.0-10.0	5.6-7.3	---	---
	3-7	2-10	1.0-6.0	5.6-7.3	---	---
	7-21	5-15	2.0-9.0	6.1-7.3	---	---
	21-60	0-3	0.0-2.0	7.4-8.4	5-30	---
1200:						
Egglake---------	0-4	8-15	7.0-17.0	5.6-7.3	---	---
	4-9	3-10	2.0-10.0	5.6-7.3	---	---
	9-20	18-30	7.0-18.0	5.6-7.3	---	---
	20-60	10-18	4.0-11.0	7.4-8.4	10-20	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1201C:						
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-14	2-10	2.0-8.0	5.6-7.3	---	---
	14-24	10-18	5.0-10.0	5.6-7.3	---	---
	24-60	1-5	1.0-5.0	7.4-8.4	5-15	---
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---
	2-14	5-15	3.0-14.0	5.1-6.5	---	---
	14-29	18-30	8.0-16.0	5.6-7.3	---	---
	29-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
1201E:						
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-11	2-10	2.0-8.0	5.6-7.3	---	---
	11-15	10-18	5.0-10.0	5.6-7.3	---	---
	15-60	1-5	1.0-5.0	7.4-8.4	5-15	---
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---
	2-15	5-15	3.0-14.0	5.1-6.5	---	---
	15-28	18-30	8.0-16.0	5.6-7.3	---	---
	28-60	7-18	3.0-10.0	7.4-8.4	15-25	---
	41-80	7-18	3.0-10.0	7.4-8.4	5-15	---
1210:						
Paddock---------	0-9	8-15	---	5.6-7.3	---	---
	9-16	3-10	---	5.6-6.5	---	---
	16-29	8-18	---	6.6-7.3	---	---
	29-60	6-15	---	6.6-8.4	---	---
Epoufette-------	0-8	5-15	10.0-20.0	6.1-7.3	---	---
	8-17	5-15	4.0-14.0	6.1-7.3	0-5	---
	17-25	8-18	4.0-10.0	6.6-7.8	0-10	---
	25-60	0-8	1.0-5.0	7.4-8.4	5-10	---
1211:						
Egglake---------	0-4	5-15	6.0-17.0	5.6-7.3	---	---
	4-9	3-10	2.0-10.0	5.6-7.3	---	---
	9-25	18-30	7.0-18.0	5.6-7.3	---	---
	25-60	10-18	4.0-11.0	7.4-8.4	10-20	---
Cathro----------	0-17	---	120-170	4.5-7.8	---	---
	17-60	10-30	2.0-25.0	6.6-8.4	5-25	---
1225:						
Wykeham---------	0-8	5-18	6.0-23.0	5.1-6.5	---	---
	8-16	5-15	4.0-13.0	5.1-6.5	---	---
	16-37	18-30	8.0-20.0	5.6-7.3	---	---
	37-60	10-18	4.0-12.0	7.4-8.4	10-25	---
Karlstad--------	0-12	5-15	2.0-20.0	4.5-7.3	---	---
	12-18	5-18	2.0-15.0	6.1-7.3	0-15	---
	18-29	5-18	1.0-15.0	6.1-7.8	0-15	---
	29-60	1-5	0.0-1.0	7.4-8.4	5-30	---
1227:						
Quam----------	0-33	22-27	20.0-40.0	6.6-7.8	---	---
	33-50	22-35	20.0-40.0	6.6-7.8	0-15	---
	50-60	20-35	12.0-25.0	7.4-8.4	5-20	---
Cathro----------	0-24	---	150-230	4.5-7.8	---	---
	24-60	10-30	2.0-20.0	5.6-8.4	5-25	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1227:						
Urness----------	0-20	18-27	40.0-50.0	7.4-8.4	5-25	---
	20-45	18-35	40.0-50.0	7.4-8.4	5-25	---
	45-60	18-35	20.0-40.0	7.4-8.4	5-25	---
1230:						
Haslie----------	0-18	---	140-180	5.6-7.8	---	---
	18-60	18-35	10.0-45.0	7.4-8.4	60-80	---
Nidaros---------	0-38	---	110-170	4.5-7.8	---	---
	38-54	8-35	13.0-51.0	5.6-8.4	---	---
	54-60	0-4	1.0-3.0	5.6-8.4	0-5	---
1234B:						
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---
	8-15	24-35	13.0-22.0	6.6-7.8	20-30	---
	15-60	18-35	9.0-18.0	7.4-8.4	12-20	---
Buse----------	0-7	27-35	14.0-25.0	6.6-8.4	0-25	---
	7-60	18-35	11.0-16.0	7.4-8.4	12-30	---
1235B:						
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---
	8-11	24-35	13.0-22.0	6.6-7.8	20-30	---
	11-60	18-35	9.0-18.0	7.4-8.4	12-20	---
Buse----------	0-8	18-27	11.0-20.0	6.6-8.4	0-25	---
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---
	8-12	0-5	1.0-6.0	7.4-8.4	10-25	---
1236B:						
Eagleview-------	0-2	2-10	10.0-15.0	5.6-7.3	---	---
	2-11	2-10	10.0-15.0	5.6-7.3	---	---
	11-48	2-10	5.0-10.0	6.1-7.3	---	---
	48-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1236C:						
Eagleview-------	0-7	2-10	10.0-15.0	5.6-7.3	---	---
	7-23	2-10	10.0-15.0	5.6-7.3	---	---
	23-37	2-10	5.0-10.0	6.1-7.3	---	---
	37-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1236E:						
Eagleview-------	0-3	2-10	10.0-15.0	5.6-7.3	---	---
	3-16	2-10	10.0-15.0	5.6-7.3	---	---
	16-40	2-10	5.0-10.0	6.1-7.3	---	---
	40-60	2-10	0.0-5.0	6.1-8.4	0-10	---
1238E:						
Two Inlets------	0-2	2-10	2.0-8.0	5.6-7.3	---	---
	2-10	2-10	1.0-6.0	5.6-7.3	---	---
	10-33	5-15	2.0-9.0	6.1-7.3	---	---
	33-60	0-3	0.0-2.0	7.4-8.4	5-30	---
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-12	2-10	2.0-8.0	5.6-7.3	---	---
	12-18	10-18	5.0-10.0	5.6-7.3	---	---
	18-60	1-5	1.0-5.0	7.4-8.4	5-15	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1242D:						
Sandberg--------	0-7	5-15	4.0-16.0	5.6-7.8	0-5	---
	7-19	0-5	1.0-6.0	7.4-8.4	10-25	---
	19-60	0-5	1.0-4.0	7.4-8.4	5-10	---
Arvilla---------	0-7	6-18	5.0-20.0	6.1-8.4	---	---
	7-17	6-18	5.0-15.0	6.6-8.4	---	---
	17-60	2-10	1.0-5.0	7.4-8.4	1-5	---
1243B:						
Sol----------	0-3	4-16	4.0-14.0	5.1-6.5	---	---
	3-17	2-12	1.0-6.0	5.1-6.5	---	---
	17-30	18-27	9.0-14.0	5.6-7.3	---	---
	30-60	8-18	2.0-9.0	7.4-7.8	10-20	---
1243C:						
Sol----------	0-2	4-16	4.0-14.0	5.1-6.5	---	---
	2-18	2-12	1.0-6.0	5.1-6.5	---	---
	18-30	18-27	9.0-14.0	5.6-7.3	---	---
	30-60	8-18	2.0-9.0	7.4-7.8	10-20	---
1243E:						
Sol----------	0-3	4-16	4.0-14.0	5.1-6.5	---	---
	3-18	2-12	1.0-6.0	5.1-6.5	---	---
	18-36	18-27	9.0-14.0	5.6-7.3	---	---
	36-60	8-18	2.0-9.0	7.4-7.8	10-20	---
1244B:						
Sol----------	0-2	4-16	4.0-14.0	5.1-6.5	---	---
	2-21	2-12	1.0-6.0	5.1-6.5	---	---
	21-30	18-27	9.0-14.0	5.6-7.3	---	---
	30-60	8-18	2.0-9.0	7.4-7.8	10-20	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-13	2-10	2.0-8.0	5.6-7.3	---	---
	13-21	10-18	5.0-10.0	5.6-7.3	---	---
	21-60	1-5	1.0-5.0	7.4-8.4	5-15	---
1244C:						
Sol----------	0-2	4-16	4.0-14.0	5.1-6.5	---	---
	2-22	2-12	1.0-6.0	5.1-6.5	---	---
	22-31	18-27	9.0-14.0	5.6-7.3	---	---
	31-60	8-18	2.0-9.0	7.4-7.8	10-20	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---
	2-18	2-10	2.0-8.0	5.6-7.3	---	---
	18-38	10-18	5.0-10.0	5.6-7.3	---	---
	38-60	1-5	1.0-5.0	7.4-8.4	5-15	---
1244E:						
Sol----------	0-3	4-16	4.0-14.0	5.1-6.5	---	---
	3-23	2-12	1.0-6.0	5.1-6.5	---	---
	23-30	18-27	9.0-14.0	5.6-7.3	---	---
	30-60	8-18	2.0-9.0	7.4-7.8	10-20	---
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---
	3-17	2-10	2.0-8.0	5.6-7.3	---	---
	17-47	10-18	5.0-10.0	5.6-7.3	---	---
	47-60	1-5	1.0-5.0	7.4-8.4	5-15	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1246:						
Winger----------	0-15	27-35	---	7.4-8.4	---	---
	15-37	18-35	---	7.4-8.4	---	---
	37-60	18-32	---	7.4-8.4	---	---
1247D:						
Corliss---------	0-9	2-10	3.0-12.0	6.1-7.8	0-15	---
	9-16	0-10	1.0-6.0	6.1-7.8	0-15	---
	16-60	0-5	0.0-3.0	7.4-8.4	5-30	---
Dorset----------	0-9	4-18	10.0-23.0	5.6-7.3	---	---
	9-17	10-18	7.0-17.0	5.6-7.3	---	---
	17-25	5-10	3.0-8.0	7.4-8.4	10-25	---
	25-60	0-5	0.0-5.0	7.4-8.4	5-15	---
1248C:						
Nymore----------	0-7	2-12	3.0-13.0	5.1-6.5	---	---
	7-55	0-5	0.0-5.0	5.1-7.3	---	---
	55-60	0-5	0.0-1.0	5.1-7.8	---	---
Verndale--------	0-6	7-12	7.0-15.0	5.6-7.3	---	---
	6-27	7-18	3.0-12.0	5.6-7.3	---	---
	27-48	2-6	2.0-4.0	5.6-7.3	---	---
	48-60	0-4	0.0-3.0	6.1-8.4	0-30	---
1249C:						
Graycalm--------	0-8	0-10	4.0-12.0	4.5-6.5	---	---
	8-18	0-15	2.0-4.0	4.5-7.3	---	---
	18-37	0-10	1.0-5.0	4.5-7.3	---	---
	37-60	0-10	0.0-2.0	5.6-8.4	---	---
Bootlake--------	0-8	5-15	4.0-15.0	5.6-7.3	---	---
	8-17	2-10	1.0-10.0	5.6-7.3	---	---
	17-27	10-18	5.0-12.0	5.6-7.3	---	---
	27-60	1-5	1.0-5.0	7.4-8.4	5-20	---
1250C:						
Abbeylake-------	0-9	2-10	3.0-15.0	6.1-7.3	0-15	---
	9-16	0-10	1.0-8.0	6.1-7.3	0-15	---
	16-60	0-3	1.0-5.0	7.4-8.4	5-30	---
Verndale--------	0-8	7-12	7.0-15.0	5.6-7.3	---	---
	8-14	7-18	3.0-12.0	5.6-7.3	---	---
	14-28	2-6	2.0-4.0	5.6-7.3	---	---
	28-60	0-4	0.0-3.0	6.1-8.4	0-30	---
1251:						
Lamoure---------	0-41	20-26	22.0-29.0	7.4-8.4	0-10	0-4
	41-53	20-34	24.0-31.0	7.4-8.4	9-20	0-4
	53-60	20-34	16.0-23.0	7.4-8.4	4-20	0-4
1252B:						
Bootlake--------	0-3	5-15	4.0-15.0	5.6-7.3	---	---
	3-14	2-10	1.0-10.0	5.6-7.3	---	---
	14-41	10-18	5.0-12.0	5.6-7.3	---	---
	41-60	1-5	1.0-5.0	7.4-8.4	5-20	---
Eagleview-------	0-2	2-10	10.0-15.0	5.6-7.3	---	---
	2-12	2-10	10.0-15.0	5.6-7.3	---	---
	12-42	2-10	5.0-10.0	6.1-7.3	---	---
	42-60	2-10	0.0-5.0	6.1-8.4	0-10	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1263C:						
Eagleview-------	0-3	2-10	10.0-15.0	5.6-7.3	---	---
	3-17	2-10	10.0-15.0	5.6-7.3	---	---
	17-32	2-10	5.0-10.0	6.1-7.3	---	---
	32-60	2-10	0.0-5.0	6.1-8.4	0-10	---
Bootlake--------	0-3	5-15	4.0-15.0	5.6-7.3	---	---
	3-15	2-10	1.0-10.0	5.6-7.3	---	---
	15-24	10-18	5.0-12.0	5.6-7.3	---	---
	24-60	1-5	1.0-5.0	7.4-8.4	5-20	---
1291:						
Sedgeville------	0-8	0-23	10.0-45.0	6.1-8.4	0-20	---
	8-34	8-17	5.0-20.0	6.1-8.4	0-20	---
	34-60	2-5	2.0-5.0	6.6-8.4	0-20	---
1306:						
Karlstad--------	0-15	5-15	2.0-20.0	4.5-7.3	---	---
	15-27	5-18	2.0-15.0	6.1-7.3	0-15	---
	27-60	1-5	0.0-1.0	7.4-8.4	5-30	---
1317:						
Vallers---------	0-15	28-35	15.0-28.0	7.4-8.4	12-25	0-4
	15-23	18-35	10.0-18.0	7.4-8.4	20-35	0-4
	23-60	18-35	8.0-16.0	7.4-8.4	12-25	0-4
1318:						
Darnen----------	0-56	18-27	15.0-30.0	6.6-7.8	---	---
	56-60	18-30	10.0-20.0	6.1-7.8	0-5	---
1319B:						
Rockwood--------	0-4	5-15	---	5.1-6.5	---	---
	4-14	5-10	---	5.1-6.5	---	---
	14-19	8-18	---	5.6-7.3	---	---
	19-30	8-18	---	5.6-7.3	---	---
	30-60	7-15	---	6.1-8.4	---	---
1319C:						
Rockwood--------	0-7	5-15	---	5.1-6.5	---	---
	7-16	5-10	---	5.1-6.5	---	---
	16-23	8-18	---	5.6-7.3	---	---
	23-31	8-18	---	5.6-7.3	---	---
	31-60	7-15	---	6.1-8.4	---	---
1319D:						
Rockwood--------	0-2	5-15	---	5.1-6.5	---	---
	2-15	5-10	---	5.1-6.5	---	---
	15-21	8-18	---	5.6-7.3	---	---
	21-32	8-18	---	5.6-7.3	---	---
	32-60	7-15	---	6.1-8.4	---	---
1320B:						
Blowers---------	0-3	5-15	---	5.1-7.3	---	---
	3-14	5-10	---	5.1-6.5	---	---
	14-22	8-18	---	5.6-7.3	---	---
	22-32	8-18	---	5.6-7.3	---	---
	32-60	7-15	---	6.6-8.4	---	---
1321:						
Paddock---------	0-4	8-15	---	5.6-7.3	---	---
	4-16	3-10	---	5.6-6.5	---	---
	16-43	8-18	---	6.6-7.3	---	---
	43-60	6-15	---	6.6-8.4	---	---

CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity
	In	Pct	meq/100g	pH	Pct	mmhos/cm
1365:						
Hillview--------	0-8	5-15	6.0-15.0	5.1-7.3	---	---
	8-19	3-12	3.0-8.0	5.1-6.5	---	---
	19-28	8-18	5.0-11.0	5.1-7.3	---	---
	28-60	3-12	2.0-7.0	5.1-8.4	0-12	---
1825B:						
Seelyeville-----	0-60	---	140-200	6.1-7.8	0-15	---
1878:						
Hamre----------	0-14	---	160-200	5.1-7.8	0-5	---
	14-19	18-35	16.0-28.0	5.1-7.8	0-10	---
	19-60	18-35	10.0-22.0	7.4-8.4	5-30	---
1938:						
Lakepark--------	0-8	27-35	25.0-40.0	6.1-7.8	---	---
	8-28	20-35	12.0-30.0	6.1-7.8	---	---
	28-34	22-35	13.0-30.0	6.6-7.8	---	---
	34-60	22-35	13.0-30.0	7.4-8.4	10-20	---
1942:						
Forada----------	0-10	10-22	14.0-45.0	6.6-7.8	0-15	---
	10-21	8-18	4-120	6.6-7.8	0-15	---
	21-60	0-5	0.0-5.0	7.4-8.4	5-30	---
1967:						
Hamerly---------	0-9	27-35	---	6.6-8.4	---	---
	9-20	18-35	---	7.4-8.4	---	---
	20-60	18-35	---	7.4-8.4	---	---
Vallers---------	0-15	28-35	15.0-28.0	7.4-8.4	12-25	0-4
	15-25	18-35	10.0-18.0	7.4-8.4	20-35	0-4
	25-60	18-35	8.0-16.0	7.4-8.4	12-25	0-4
1975:						
Oylen----------	0-13	7-12	8.0-14.0	6.1-7.3	---	---
	13-22	7-18	5.0-13.0	6.1-7.3	---	---
	22-52	2-6	1.0-3.0	6.1-7.3	---	---
	52-60	0-4	0.0-2.0	6.6-8.4	0-15	---
1997:						
Vallers---------	0-15	28-35	15.0-28.0	7.4-8.4	12-25	0-4
	15-27	18-35	10.0-18.0	7.4-8.4	20-35	0-4
	27-60	18-35	8.0-16.0	7.4-8.4	12-25	0-4
Hamerly---------	0-9	27-35	---	6.6-8.4	---	---
	9-21	18-35	---	7.4-8.4	---	---
	21-60	18-35	---	7.4-8.4	---	---
Winger----------	0-22	27-35	27.0-38.0	7.4-8.4	5-20	---
	22-35	18-35	9.0-18.0	7.4-8.4	15-35	---
	35-60	18-32	9.0-16.0	7.4-8.4	15-30	---

WATER FEATURES

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
20B:							
Chapett---------	B	None-------	---	---	>6.0	---	---
20C2:							
Chapett---------	B	None-------	---	---	>6.0	---	---
20E:							
Chapett---------	B	None-------	---	---	>6.0	---	---
26:							
Aazdahl---------	B	None-------	---	---	2.5-3.5	Apparent---	Mar-May
33B:							
Barnes----------	B	None-------	---	---	>6.0	---	---
36:							
Flom----------	B/D	None-------	---	---	0.5-1.5	Apparent---	Nov-Jul
38B:							
Waukon----------	B	None-------	---	---	>6.0	---	---
38C:							
Waukon----------	B	None-------	---	---	>6.0	---	---
38E:							
Waukon----------	B	None-------	---	---	>6.0	---	---
40B:							
Nebish----------	B	None-------	---	---	>6.0	---	---
40C:							
Nebish----------	B	None-------	---	---	>6.0	---	---
40E:							
Nebish----------	B	None-------	---	---	>6.0	---	---
47:							
Colvin----------	C/D	None-------	---	---	0.5-1.5	Apparent---	Apr-Jul
63:							
Rockwell--------	B/D	None-------	---	---	0.5-1.5	Apparent---	Apr-Jul
108:							
McIntosh--------	B	None-------	---	---	2.5-3.5	Apparent---	Apr-Nov
111:							
Hangaard--------	D	None-------	---	---	0.5-1.5	Apparent---	Apr-Jul
121:							
Wykeham---------	B	None-------	---	---	2.5-4.0	Apparent---	Apr-Jun
125:							
Beltrami--------	B	None-------	---	---	2.5-4.0	Apparent---	Nov-Jun
133A:							
Dalbo----------	B	None-------	---	---	2.5-4.0	Apparent---	Nov-May
133B:							
Dalbo----------	B	None-------	---	---	2.5-4.0	Apparent---	Nov-May
133C:							
Dalbo----------	B	None-------	---	---	2.5-4.0	Apparent---	Nov-May

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
133E:							
Dalbo	B	None	---	---	2.5-4.0	Apparent	Nov-May
137:							
Dovray	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec
141B:							
Egeland	B	None	---	---	>6.0	---	---
141C:							
Egeland	B	None	---	---	>6.0	---	---
168B:							
Forman	B	None	---	---	>6.0	---	---
168C2:							
Forman	B	None	---	---	>6.0	---	---
168D2:							
Forman	B	None	---	---	>6.0	---	---
168E:							
Forman	B	None	---	---	>6.0	---	---
171B:							
Formdale	B	None	---	---	>6.0	---	---
180:							
Gonvick	B	None	---	---	2.5-4.0	Apparent	Nov-Jun
184:							
Hamerly	C	None	---	---	2.0-4.0	Apparent	Apr-Jun
191:							
Epoufette	B/D	None	---	---	0.5-2.0	Apparent	Nov-Jun
202:							
Meehan	B	None	---	---	1.0-3.0	Apparent	Oct-Jun
207D:							
Nymore	A	None	---	---	>6.0	---	---
267B:							
Snellman	B	None	---	---	>6.0	---	---
267C:							
Snellman	B	None	---	---	>6.0	---	---
267E:							
Snellman	B	None	---	---	>6.0	---	---
315A:							
Bootlake	B	None	---	---	>6.0	---	---
315B:							
Bootlake	B	None	---	---	>6.0	---	---
332B:							
Sugarbush	B	None	---	---	>6.0	---	---
335:							
Urness	B/D	None	---	---	+1-0.5	Apparent	Jan-Dec

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
339:							
Fordville	B	None	---	---	>6.0	---	---
344:							
Quam	B/D	None	---	---	+1-0.5	Apparent	Jan-Dec
351:							
Colvin	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec
375:							
Forada	B/D	None	---	---	0.5-1.5	Apparent	Oct-Jun
398:							
Winger	B/D	None	---	---	+1-0.5	Apparent	Jan-Dec
406A:							
Dorset	B	None	---	---	>6.0	---	---
406B:							
Dorset	B	None	---	---	>6.0	---	---
413:							
Osakis	B	None	---	---	2.5-4.0	Apparent	Nov-Jun
418:							
Lamoure	C	Occasional	Brief	Mar-Oct	0.0-1.5	Apparent	Oct-Jun
422B:							
Bygland	C	None	---	---	2.5-4.0	Apparent	Apr-Jun
422C:							
Bygland	C	None	---	---	2.5-4.0	Apparent	Apr-Jun
503B:							
Balmlake	B	None	---	---	>6.0	---	---
503C:							
Balmlake	B	None	---	---	>6.0	---	---
503E:							
Balmlake	B	None	---	---	>6.0	---	---
508:							
Wyndmere	B	None	---	---	1.5-3.5	Apparent	Sep-Jun
540:							
Seelyeville	A/D	None	---	---	+1-0.5	Apparent	Oct-Jun
541:							
Rifle	A/D	None	---	---	+1-1.0	Apparent	Nov-Jun
544:							
Cathro	A/D	None	---	---	+1-1.0	Apparent	Oct-Jun
564:							
Friendship	A	None	---	---	3.5-6.0	Apparent	Oct-Jun
567A:							
Verndale	B	None	---	---	>6.0	---	---
567B:							
Verndale	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
579C2:							
Formdale--------	B	None-------	---	---	>6.0	---	---
Langhei---------	B	None-------	---	---	>6.0	---	---
Sandberg--------	A	None-------	---	---	>6.0	---	---
624:							
Rosy----------	B	None-------	---	---	2.5-3.5	Apparent---	Mar-Jun
701:							
Runeberg--------	C/D	None-------	---	---	+1-0.0	Apparent---	Jan-Dec
711B:							
Arvilla---------	B	None-------	---	---	>6.0	---	---
Sandberg--------	A	None-------	---	---	>6.0	---	---
711C:							
Arvilla---------	B	None-------	---	---	>6.0	---	---
Sandberg--------	A	None-------	---	---	>6.0	---	---
718B:							
Naytahwaush-----	B	None-------	---	---	>6.0	---	---
718C:							
Naytahwaush-----	B	None-------	---	---	>6.0	---	---
718E:							
Naytahwaush-----	B	None-------	---	---	>6.0	---	---
721E:							
Corliss---------	A	None-------	---	---	>6.0	---	---
746:							
Haslie----------	A/D	None-------	---	---	+1-0.5	Apparent---	Nov-Jul
747B:							
Audubon---------	C	None-------	---	---	3.0-6.0	Perched----	Oct-Jun
753D:							
Abbeylake-------	A	None-------	---	---	>6.0	---	---
753E:							
Abbeylake-------	A	None-------	---	---	>6.0	---	---
765:							
Smiley----------	B/D	None-------	---	---	0.5-1.5	Apparent---	Apr-Jul
767:							
Auganaush-------	C	None-------	---	---	0.5-1.5	Apparent---	Oct-Jun
775B:							
Sugarbush-------	B	None-------	---	---	>6.0	---	---
Two Inlets------	A	None-------	---	---	>6.0	---	---
775C:							
Sugarbush-------	B	None-------	---	---	>6.0	---	---
Two Inlets------	A	None-------	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
776B:							
Snellman	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
776C:							
Snellman	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
776E:							
Snellman	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
778B:							
Dorset	B	None	---	---	>6.0	---	---
Corliss	A	None	---	---	>6.0	---	---
778C:							
Dorset	B	None	---	---	>6.0	---	---
Corliss	A	None	---	---	>6.0	---	---
780B:							
Audubon	C	None	---	---	3.0-6.0	Perched	Oct-Jun
Boyerlake	C	None	---	---	2.5-4.0	Apparent	Oct-Jun
780C2:							
Audubon	C	None	---	---	3.0-6.0	Perched	Oct-Jun
Boyerlake	C	None	---	---	2.5-4.0	Apparent	Oct-Jun
780D2:							
Audubon	C	None	---	---	3.0-6.0	Perched	Oct-Jun
Boyerlake	C	None	---	---	2.5-4.0	Apparent	Oct-Jun
785:							
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun
Winger	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun
786:							
Winger	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun
Colvin	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec
797:							
Mooselake	A/D	None	---	---	0.0-1.0	Apparent	Jan-Dec
Lupton	A/D	None	---	---	0.0-1.0	Apparent	Sep-May
867B:							
Graycalm	A	None	---	---	>6.0	---	---
Menahga	A	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
867C:							
Graycalm	A	None	---	---	>6.0	---	---
Menahga	A	None	---	---	>6.0	---	---
867E:							
Graycalm	A	None	---	---	>6.0	---	---
Menahga	A	None	---	---	>6.0	---	---
903B:							
Barnes	B	None	---	---	>6.0	---	---
Langhei	B	None	---	---	>6.0	---	---
903C2:							
Barnes	B	None	---	---	>6.0	---	---
Langhei	B	None	---	---	>6.0	---	---
931C2:							
Formdale	B	None	---	---	>6.0	---	---
Langhei	B	None	---	---	>6.0	---	---
942D2:							
Langhei	B	None	---	---	>6.0	---	---
Barnes	B	None	---	---	>6.0	---	---
943D2:							
Langhei	B	None	---	---	>6.0	---	---
Formdale	B	None	---	---	>6.0	---	---
943E:							
Langhei	B	None	---	---	>6.0	---	---
Formdale	B	None	---	---	>6.0	---	---
951B:							
Nebish	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
951C:							
Nebish	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
951E:							
Nebish	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
1015:							
Udipsamments	A	None	---	---	>6.0	---	---
1016:							
Udorthents	B	None	---	---	>6.0	---	---
1027:							
Udorthents.							

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1030:							
Pits.							
Udipsamments----	A	None-------	---	---	>6.0	---	---
1104B:							
Waukon----------	B	None-------	---	---	>6.0	---	---
Dorset----------	B	None-------	---	---	>6.0	---	---
1104C:							
Waukon----------	B	None-------	---	---	>6.0	---	---
Dorset----------	B	None-------	---	---	>6.0	---	---
1111:							
Nidaros---------	A/D	Frequent---	Long------	Mar-Nov	+1-0.5	Apparent---	Oct-Jun
1113:							
Haslie----------	D	None-------	---	---	+3-0.0	Apparent---	Jan-Dec
Seelyeville-----	D	None-------	---	---	+3-0.0	Apparent---	Jan-Dec
Cathro----------	D	None-------	---	---	+4-0.5	Apparent---	Jan-Dec
1125B:							
Sverdrup--------	B	None-------	---	---	>6.0	---	---
Abbeylake-------	A	None-------	---	---	>6.0	---	---
1125C:							
Sverdrup--------	B	None-------	---	---	>6.0	---	---
Abbeylake-------	A	None-------	---	---	>6.0	---	---
1126B:							
Verndale--------	B	None-------	---	---	>6.0	---	---
Nymore----------	A	None-------	---	---	>6.0	---	---
1127A:							
Bootlake--------	B	None-------	---	---	>6.0	---	---
Graycalm--------	A	None-------	---	---	>6.0	---	---
1127B:							
Bootlake--------	B	None-------	---	---	>6.0	---	---
Graycalm--------	A	None-------	---	---	>6.0	---	---
1128:							
Cathro----------	A/D	Frequent---	Long------	Mar-Nov	+1-1.0	Apparent---	Oct-Jun
1129:							
Lindaas---------	C/D	None-------	---	---	0.5-1.5	Apparent---	Oct-Jul
1130:							
Wolverton-------	B	None-------	---	---	2.5-4.0	Apparent---	Mar-Jun
1131B:							
Verndale--------	B	None-------	---	---	>6.0	---	---
Abbeylake-------	A	None-------	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1132B:							
Eagleview--------	A	None--------	---	---	>6.0	---	---
Balmlake---------	B	None--------	---	---	>6.0	---	---
1132C:							
Eagleview--------	A	None--------	---	---	>6.0	---	---
Balmlake---------	B	None--------	---	---	>6.0	---	---
1132E:							
Eagleview--------	A	None--------	---	---	>6.0	---	---
Balmlake---------	B	None--------	---	---	>6.0	---	---
1135:							
Foxlake----------	C	None--------	---	---	0.5-1.5	Perched----	Oct-Jun
1136:							
Nidaros----------	A/D	None--------	---	---	+1-0.5	Apparent---	Oct-Jun
1137B:							
Birchlake--------	C	None--------	---	---	2.5-4.0	Perched----	Oct-Jun
1137C:							
Birchlake--------	C	None--------	---	---	2.5-4.0	Perched----	Oct-Jun
1137D:							
Birchlake--------	C	None--------	---	---	2.5-4.0	Perched----	Oct-Jun
Birchlake--------	C	None--------	---	---	2.5-4.0	Perched----	Oct-Jun
1138:							
Rushlake---------	A	None--------	---	---	2.5-4.0	Apparent---	Jan-Dec
Hangaard---------	D	None--------	---	---	0.5-1.5	Apparent---	Apr-Jul
1140B:							
Eagleview--------	A	None--------	---	---	>6.0	---	---
Snellman---------	B	None--------	---	---	>6.0	---	---
1140C:							
Eagleview--------	A	None--------	---	---	>6.0	---	---
Snellman---------	B	None--------	---	---	>6.0	---	---
1149:							
Hamerly----------	C	None--------	---	---	2.0-4.0	Apparent---	Apr-Jun
1195B:							
Sybil------------	B	None--------	---	---	>6.0	---	---
Eagleview--------	A	None--------	---	---	>6.0	---	---
1195C:							
Sybil------------	B	None--------	---	---	>6.0	---	---
Eagleview--------	A	None--------	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1195E:							
Sybil	B	None	---	---	>6.0	---	---
Eagleview	A	None	---	---	>6.0	---	---
1196B:							
Lida	B	None	---	---	>6.0	---	---
Two Inlets	A	None	---	---	>6.0	---	---
1196C:							
Lida	B	None	---	---	>6.0	---	---
Two Inlets	A	None	---	---	>6.0	---	---
1196E:							
Lida	B	None	---	---	>6.0	---	---
Two Inlets	A	None	---	---	>6.0	---	---
1200:							
Egglake	B	None	---	---	0.5-1.5	Apparent	Oct-Jul
1201C:							
Sugarbush	B	None	---	---	>6.0	---	---
Snellman	B	None	---	---	>6.0	---	---
1201E:							
Sugarbush	B	None	---	---	>6.0	---	---
Snellman	B	None	---	---	>6.0	---	---
1210:							
Paddock	C/D	None	---	---	1.0-2.0	Perched	Nov-Jun
Epoufette	B/D	None	---	---	0.5-2.0	Apparent	Nov-Jun
1211:							
Egglake	B	None	---	---	0.5-1.5	Apparent	Oct-Jul
Cathro	A/D	None	---	---	+1-1.0	Apparent	Oct-Jun
1225:							
Wykeham	B	None	---	---	2.5-4.0	Apparent	Apr-Jun
Karlstad	A	None	---	---	2.5-4.0	Apparent	Apr-Jul
1227:							
Quam	B/D	None	---	---	+3-0.5	Apparent	Jan-Dec
Cathro	D	None	---	---	+4-0.5	Apparent	Jan-Dec
Urness	B/D	None	---	---	+3-0.0	Apparent	Jan-Dec
1230:							
Haslie	D	None	---	---	+3-0.0	Apparent	Jan-Dec
Nidaros	D	None	---	---	+3-0.0	Apparent	Jan-Dec

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1234B:							
Formdale	B	None	---	---	>6.0	---	---
Buse	B	None	---	---	>6.0	---	---
1235B:							
Formdale	B	None	---	---	>6.0	---	---
Buse	B	None	---	---	>6.0	---	---
Sandberg	A	None	---	---	>6.0	---	---
1236B:							
Eagleview	A	None	---	---	>6.0	---	---
1236C:							
Eagleview	A	None	---	---	>6.0	---	---
1236E:							
Eagleview	A	None	---	---	>6.0	---	---
1238E:							
Two Inlets	A	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
1242D:							
Sandberg	A	None	---	---	>6.0	---	---
Arvilla	B	None	---	---	>6.0	---	---
1243B:							
Sol	B	None	---	---	>6.0	---	---
1243C:							
Sol	B	None	---	---	>6.0	---	---
1243E:							
Sol	B	None	---	---	>6.0	---	---
1244B:							
Sol	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
1244C:							
Sol	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
1244E:							
Sol	B	None	---	---	>6.0	---	---
Sugarbush	B	None	---	---	>6.0	---	---
1246:							
Winger	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun
1247D:							
Corliss	A	None	---	---	>6.0	---	---
Dorset	B	None	---	---	>6.0	---	---

WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1248C:							
Nymore	A	None	---	---	>6.0	---	---
Verndale	B	None	---	---	>6.0	---	---
1249C:							
Graycalm	A	None	---	---	>6.0	---	---
Bootlake	B	None	---	---	>6.0	---	---
1250C:							
Abbeylake	A	None	---	---	>6.0	---	---
Verndale	B	None	---	---	>6.0	---	---
1251:							
Lamoure	C	Frequent	Brief	Mar-Oct	0.0-1.5	Apparent	Oct-Jun
1252B:							
Bootlake	B	None	---	---	>6.0	---	---
Eagleview	A	None	---	---	>6.0	---	---
1263C:							
Eagleview	A	None	---	---	>6.0	---	---
Bootlake	B	None	---	---	>6.0	---	---
1291:							
Sedgeville	D	Frequent	Long	Mar-Jun	+1-0.5	Apparent	Jan-Dec
1306:							
Karlstad	A	None	---	---	2.5-4.0	Apparent	Apr-Jul
1317:							
Vallers	C	None	---	---	0.5-1.5	Apparent	Apr-Jun
1318:							
Darnen	B	None	---	---	>6.0	---	---
1319B:							
Rockwood	C	None	---	---	>6.0	---	---
1319C:							
Rockwood	C	None	---	---	>6.0	---	---
1319D:							
Rockwood	C	None	---	---	>6.0	---	---
1320B:							
Blowers	B	None	---	---	2.0-3.5	Perched	Oct-Jun
1321:							
Paddock	C/D	None	---	---	1.0-2.0	Perched	Nov-Jun
1365:							
Hillview	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jul
1825B:							
Seelyeville	D	None	---	---	0.0-2.0	Apparent	Jan-Dec
1878:							
Hamre	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec

WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table		
		Frequency	Duration	Months	Water table depth	Kind of water table	Months
					Ft		
1938:							
Lakepark--------	B/D	None-------	---	---	0.5-1.5	Apparent---	Nov-Jun
1942:							
Forada----------	B/D	None-------	---	---	+1-0.5	Apparent---	Jan-Dec
1967:							
Hamerly---------	C	None-------	---	---	1.5-3.5	Apparent---	Apr-Jun
Vallers---------	C	None-------	---	---	0.5-1.5	Apparent---	Apr-Jun
1975:							
Oylen----------	C	None-------	---	---	2.5-3.5	Apparent---	Oct-Jun
1997:							
Vallers---------	C	None-------	---	---	0.5-1.5	Apparent---	Apr-Jun
Hamerly---------	C	None-------	---	---	2.0-4.0	Apparent---	Apr-Jun
Winger----------	B/D	None-------	---	---	+1-0.5	Apparent---	Jan-Dec

SOIL FEATURES

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
20B, 20C2, 20E:							
Chapett	>60	---	---	---	Moderate	Low	Low.
26:							
Aazdahl	>60	---	---	---	High	Moderate	Low.
33B:							
Barnes	>60	---	---	---	Moderate	Moderate	Low.
36:							
Flom	>60	---	---	---	High	High	Low.
38B, 38C, 38E:							
Waukon	>60	---	---	---	Moderate	Low	Low.
40B, 40C, 40E:							
Nebish	>60	---	---	---	Moderate	Moderate	Low.
47:							
Colvin	>60	---	---	---	High	High	Low.
63:							
Rockwell	>60	---	---	---	High	High	Low.
108:							
McIntosh	>60	---	---	---	High	High	Low.
111:							
Hangaard	>60	---	---	---	Moderate	High	Low.
121:							
Wykeham	>60	---	---	---	Moderate	Moderate	Moderate.
125:							
Beltrami	>60	---	---	---	High	Moderate	Low.
133A, 133B, 133C, 133E:							
Dalbo	>60	---	---	---	High	High	Moderate.
137:							
Dovray	>60	---	---	---	Moderate	High	Low.
141B, 141C:							
Egeland	>60	---	---	---	Low	Moderate	Low.
168B, 168C2, 168D2, 168E:							
Forman	>60	---	---	---	Moderate	High	Low.
171B:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
180:							
Gonvick	>60	---	---	---	High	Moderate	Low.
184:							
Hamerly	>60	---	---	---	High	High	Low.
191:							
Epoufette	>60	---	---	---	High	High	Moderate.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
202:							
Meehan	>60	---	---	---	Moderate	Low	Moderate.
207D:							
Nymore	>60	---	---	---	Low	Low	Moderate.
267B, 267C, 267E:							
Snellman	>60	---	---	---	Moderate	Low	Moderate.
315A, 315B:							
Bootlake	>60	---	---	---	Low	Low	Low.
332B:							
Sugarbush	>60	---	---	---	Low	Low	Low.
335:							
Urness	>60	---	---	---	High	High	Low.
339:							
Fordville	>60	---	---	---	Low	Moderate	Low.
344:							
Quam	>60	---	---	---	High	High	Low.
351:							
Colvin	>60	---	---	---	High	High	Low.
375:							
Forada	>60	---	---	---	High	High	Low.
398:							
Winger	>60	---	---	---	High	High	Low.
406A, 406B:							
Dorset	>60	---	---	---	Low	Low	Moderate.
413:							
Osakis	>60	---	---	---	Moderate	Low	Low.
418:							
Lamoure	>60	---	---	---	High	High	Moderate.
422B, 422C:							
Bygland	>60	---	---	---	High	High	Low.
503B, 503C, 503E:							
Balmlake	>60	---	---	---	Moderate	Low	Moderate.
508:							
Wyndmere	>60	---	---	---	High	High	Low.
540:							
Seelyeville	>60	---	---	50-55	High	High	Moderate.
541:							
Rifle	>60	---	---	---	High	High	Low.
544:							
Cathro	>60	---	---	19-22	High	High	Low.
564:							
Friendship	>60	---	---	---	Low	Low	High.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
567A, 567B:							
Verndale	>60	---	---	---	Low	Low	Low.
579C2:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Langhei	>60	---	---	---	Moderate	Moderate	Low.
Sandberg	>60	---	---	---	Low	Moderate	Low.
624:							
Rosy	>60	---	---	---	Moderate	Moderate	Moderate.
701:							
Runeberg	>60	---	---	---	High	High	Low.
711B, 711C:							
Arvilla	>60	---	---	---	Low	Moderate	Low.
Sandberg	>60	---	---	---	Low	Moderate	Low.
718B, 718C, 718E:							
Naytahwaush	>60	---	---	---	Moderate	Moderate	Low.
721E:							
Corliss	>60	---	---	---	Low	Low	Low.
746:							
Haslie	>60	---	---	---	High	High	Moderate.
747B:							
Audubon	>60	---	---	---	Moderate	High	Low.
753D, 753E:							
Abbeylake	>60	---	---	---	Low	Low	Low.
765:							
Smiley	>60	---	---	---	High	High	Low.
767:							
Auganaush	>60	---	---	---	High	High	Moderate.
775B, 775C:							
Sugarbush	>60	---	---	---	Low	Low	Low.
Two Inlets	>60	---	---	---	Low	Low	Low.
776B, 776C, 776E:							
Snellman	>60	---	---	---	Moderate	Low	Moderate.
Sugarbush	>60	---	---	---	Low	Low	Low.
778B, 778C:							
Dorset	>60	---	---	---	Low	Low	Moderate.
Corliss	>60	---	---	---	Low	Low	Low.
780B, 780C2, 780D2:							
Audubon	>60	---	---	---	Moderate	High	Low.
Boyerlake	>60	---	---	---	Moderate	High	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
785:							
Hamerly	>60	---	---	---	High	High	Low.
Winger	>60	---	---	---	High	High	Low.
786:							
Winger	>60	---	---	---	High	High	Low.
Hamerly	>60	---	---	---	High	High	Low.
Colvin	>60	---	---	---	High	High	Low.
797:							
Mooselake	>60	---	0-12	12	High	High	High.
Lupton	>60	---	6-18	50-55	High	High	Low.
867B, 867C, 867E:							
Graycalm	>60	---	---	---	Low	Low	Moderate.
Menahga	>60	---	---	---	Low	Low	Moderate.
903B, 903C2:							
Barnes	>60	---	---	---	Moderate	Moderate	Low.
Langhei	>60	---	---	---	Moderate	Low	Low.
931C2:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Langhei	>60	---	---	---	Moderate	Moderate	Low.
942D2:							
Langhei	>60	---	---	---	Moderate	Low	Low.
Barnes	>60	---	---	---	Moderate	Moderate	Low.
943D2, 943E:							
Langhei	>60	---	---	---	Moderate	Moderate	Low.
Formdale	>60	---	---	---	Moderate	Moderate	Low.
951B, 951C, 951E:							
Nebish	>60	---	---	---	Moderate	Moderate	Low.
Sugarbush	>60	---	---	---	Low	Low	Low.
1015:							
Udipsamments	>60	---	---	---	Low	Low	Low.
1016:							
Udorthents	>60	---	---	---	Moderate	High	Moderate.
1027:							
Udorthents.							
1030:							
Pits.							
Udipsamments	>60	---	---	---	Low	Low	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
1104B, 1104C:							
Waukon	>60	---	---	---	Moderate	Low	Low.
Dorset	>60	---	---	---	Low	Low	Moderate.
1111:							
Nidaros	>60	---	---	25-30	High	High	Low.
1113:							
Haslie	>60	---	---	30-45	High	High	Moderate.
Seelyeville	>60	---	---	---	High		
Cathro	>60	---	---	---	High	High	Low.
1125B, 1125C:							
Sverdrup	>60	---	---	---	Low	Low	Low.
Abbeylake	>60	---	---	---	Low	Low	Low.
1126B:							
Verndale	>60	---	---	---	Low	Low	Low.
Nymore	>60	---	---	---	Low	Low	Moderate.
1127A, 1127B:							
Bootlake	>60	---	---	---	Low	Low	Low.
Graycalm	>60	---	---	---	Low	Low	Moderate.
1128:							
Cathro	>60	---	8-20	16-45	High	High	Moderate.
1129:							
Lindaas	>60	---	---	---	High	High	Low.
1130:							
Wolverton	>60	---	---	---	Moderate	Moderate	Low.
1131B:							
Verndale	>60	---	---	---	Low	Low	Low.
Abbeylake	>60	---	---	---	Low	Low	Low.
1132B, 1132C, 1132E:							
Eagleview	>60	---	---	---	Low	Low	Low.
Balmlake	>60	---	---	---	Moderate	Low	Moderate.
1135:							
Foxlake	>60	---	---	---	High	High	Low.
1136:							
Nidaros	>60	---	---	25-30	High	High	Low.
1137B, 1137C, 1137D, 1137E:							
Birchlake	>60	---	---	---	High	High	Low.
1138:							
Rushlake	>60	---	---	---	Moderate	Moderate	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
1138:							
Hangaard	>60	---	---	---	Moderate	High	Low.
1140B, 1140C:							
Eagleview	>60	---	---	---	Low	Low	Low.
Snellman	>60	---	---	---	Moderate	Low	Moderate.
1149:							
Hamerly	>60	---	---	---	High	High	Low.
1195B, 1195C, 1195E:							
Sybil	>60	---	---	---	Low	Low	Low.
Eagleview	>60	---	---	---	Low	Low	Low.
1196B, 1196C, 1196E:							
Lida	>60	---	---	---	Low	Low	Low.
Two Inlets	>60	---	---	---	Low	Low	Low.
1200:							
Egglake	>60	---	---	---	High	High	Low.
1201C, 1201E:							
Sugarbush	>60	---	---	---	Low	Low	Low.
Snellman	>60	---	---	---	Moderate	Low	Moderate.
1210:							
Paddock	>60	---	---	---	High	High	Moderate.
Epoufette	>60	---	---	---	High	High	Moderate.
1211:							
Egglake	>60	---	---	---	High	High	Low.
Cathro	>60	---	---	19-22	High	High	Low.
1225:							
Wykeham	>60	---	---	---	Moderate	Moderate	Moderate.
Karlstad	>60	---	---	---	Moderate	Low	Low.
1227:							
Quam	>60	---	---	---	High	High	Low.
Cathro	>60	---	---	---	High	High	Low.
Urness	>60	---	---	---	High	High	Low.
1230:							
Haslie	>60	---	---	30-45	High	High	Moderate.
Nidaros	>60	---	---	25-30	High	High	Low.
1234B:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Buse	>60	---	---	---	Moderate	Low	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
1235B:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Buse	>60	---	---	---	Moderate	Low	Low.
Sandberg	>60	---	---	---	Low	Moderate	Low.
1236B, 1236C, 1236E:							
Eagleview	>60	---	---	---	Low	Low	Low.
1238E:							
Two Inlets	>60	---	---	---	Low	Low	Low.
Sugarbush	>60	---	---	---	Low	Low	Low.
1242D:							
Sandberg	>60	---	---	---	Low	Moderate	Low.
Arvilla	>60	---	---	---	Low	Moderate	Low.
1243B, 1243C, 1243E:							
Sol	>60	---	---	---	Moderate	High	High.
1244B, 1244C, 1244E:							
Sol	>60	---	---	---	Moderate	High	High.
Sugarbush	>60	---	---	---	Low	Low	Low.
1246:							
Winger	>60	---	---	---	High	High	Low.
1247D:							
Corliss	>60	---	---	---	Low	Low	Low.
Dorset	>60	---	---	---	Low	Low	Moderate.
1248C:							
Nymore	>60	---	---	---	Low	Low	Moderate.
Verndale	>60	---	---	---	Low	Low	Low.
1249C:							
Graycalm	>60	---	---	---	Low	Low	Moderate.
Bootlake	>60	---	---	---	Low	Low	Low.
1250C:							
Abbeylake	>60	---	---	---	Low	Low	Low.
Verndale	>60	---	---	---	Low	Low	Low.
1251:							
Lamoure	>60	---	---	---	High	High	Moderate.
1252B:							
Bootlake	>60	---	---	---	Low	Low	Low.
Eagleview	>60	---	---	---	Low	Low	Low.

SOIL FEATURES--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
1263C:							
Eagleview	>60	---	---	---	Low	Low	Low.
Bootlake	>60	---	---	---	Low	Low	Low.
1291:							
Sedgeville	>60	---	---	---	High	High	Moderate.
1306:							
Karlstad	>60	---	---	---	Moderate	Low	Low.
1317:							
Vallers	>80	---	---	---	High	High	Low.
1318:							
Darnen	>60	---	---	---	Moderate	High	Low.
1319B, 1319C, 1319D:							
Rockwood	>60	---	---	---	Moderate	Low	Moderate.
1320B:							
Blowers	>60	---	---	---	High	Moderate	Moderate.
1321:							
Paddock	>60	---	---	---	High	High	Moderate.
1365:							
Hillview	>60	---	---	---	High	High	Moderate.
1825B:							
Seelyeville	>60	---	4-12	50-55	High	High	Moderate.
1878:							
Hamre	>60	---	---	---	High	High	Low.
1938:							
Lakepark	>60	---	---	---	High	High	Low.
1942:							
Forada	>60	---	---	---	High	Low	Low.
1967:							
Hamerly	>60	---	---	---	High	High	Low.
Vallers	>80	---	---	---	High	High	Low.
1975:							
Oylen	>60	---	---	---	Moderate	Moderate	Low.
1997:							
Vallers	>80	---	---	---	High	High	Low.
Hamerly	>60	---	---	---	High	High	Low.
Winger	>60	---	---	---	High	High	Low.

References

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Anderson, Curtis A. Pleistocene geology of the Comstock-Sebeka area, West-Central Minnesota. (Unpublished M.A. thesis, University of North Dakota, Grand Forks, 1976)

Clayton, Lee, and Stephen R. Moran. 1982. Chronology of Lake Wisconsin glaciation in middle North America. Quaternary Science Reviews 1: 55-82.

Fenton, Mark M., and others. 1983. Quaternary stratigraphy and history in the southern part of the Lake Agassiz basin. Geological Association of Canada Special Paper 26.

Hobbs, Howard C., and Joseph E. Goebel. 1982. Geologic map of Minnesota—Quaternary geology. Minnesota Geological Survey, University of Minnesota.

Jenny, Hans. 1941. Factors of soil formation.

Marshner, Francis J. 1974. The original vegetation of Minnesota. North Central Forest Experiment Station, map.

Norton, Arthur R. Quaternary geology of the Itaska-St. Croix Moraine Interlobate area, North-Central Minnesota. (Unpublished M.S. thesis, University of Minnesota, 1982)

Perkins, Roderic L. The late Cenozoic geology of West-Central Minnesota from Moorhead to Park Rapids. (Unpublished M.S. thesis, University of North Dakota, 1977)

Sackreiter, Donald Keith. Quaternary geology of the southern part of the Grand Forks and Bemidji Quadrangles. (Unpublished Ph.D. dissertation, University of North Dakota, Grand Forks, 1975)

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1982. National resources inventory.

United States Department of Agriculture. 1990. Minnesota agricultural statistics. Statistical Reporting Service and Minnesota Agricultural Statistics Service.

United States Department of Agriculture. 1993. Soil survey manual. U.S. Department of Agriculture Handbook 18.

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook. (Available in the State office of the Natural Resources Conservation Service, St. Paul, Minnesota)

Vandersluis, Charles. 1974. Mainly logging. Minnesota Clinic, pp. 298-302.

Wilcox, Alvin H. 1907. A pioneer history of Becker County.

Wright, H.E., Jr. 1962. Role of the Wadena Lobe in the Wisconsin Glaciation of Minnesota. Geological Society of America Bulletin 73: 73-100.

Wright, H.E., Jr. 1972a. Physiography of Minnesota. *In* Geology of Minnesota: A Centennial Volume.

Wright, H.E., Jr. 1972b. Quaternary history of Minnesota. *In* Geology of Minnesota: A Centennial Volume.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	more than 9

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the

hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at

least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate or high water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of most field crops are affected. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted under natural conditions. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under

natural conditions. Poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.
Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone,

slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter

represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay

content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk

density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10

Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in

stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

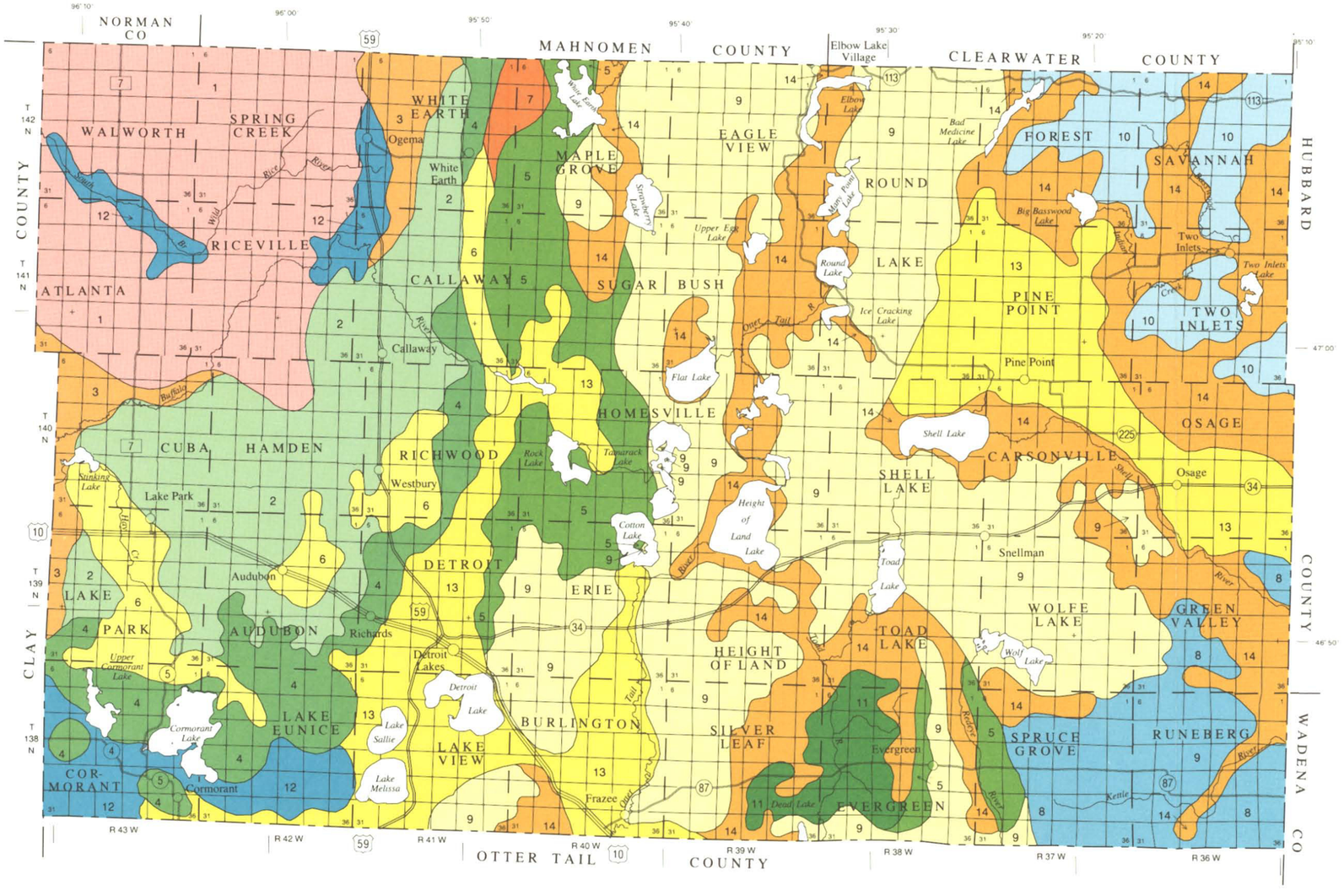
Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



SOIL LEGEND*

NEARLY LEVEL, LOAMY AND SILTY SOILS ON GROUND MORAINES

- 1 Hamerly-Winger-Vallers association

NEARLY LEVEL TO MODERATLEY STEEP, LOAMY, SILTY, AND ORGANIC SOILS ON LATERAL MORAINES

- 2 Formdale-Langhei-Flom association
- 3 Barnes-Langhei-Vallers association
- 4 Waukon-Forman-Cathro association
- 5 Nebish-Seelyeville association
- 6 Birchlake-Audubon-Foxlake association
- 7 Naytahwaush-Seelyeville association

NEARLY LEVEL TO MODERATELY STEEP, DENSE, LOAMY SOILS ON DRUMLINS

- 8 Blowers-Paddock-Rockwood association

NEARLY LEVEL TO STEEP, LOAMY, SANDY, AND ORGANIC SOILS ON END MORAINES AND GROUND MORAINES

- 9 Snellman-Rifle-Sugarbush association
- 10 Sol-Lupton-Sugarbush association
- 11 Eagleview-Seelyeville-Snellman association

NEARLY LEVEL TO STEEP, LOAMY AND SANDY SOILS ON OUTWASH PLAINS AND VALLEY TRAINS

- 12 Arvilla-Sandberg association
- 13 Verndale-Dorset-Corliss association
- 14 Sugarbush-Graycalm-Two Inlets association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1991

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
MINNESOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

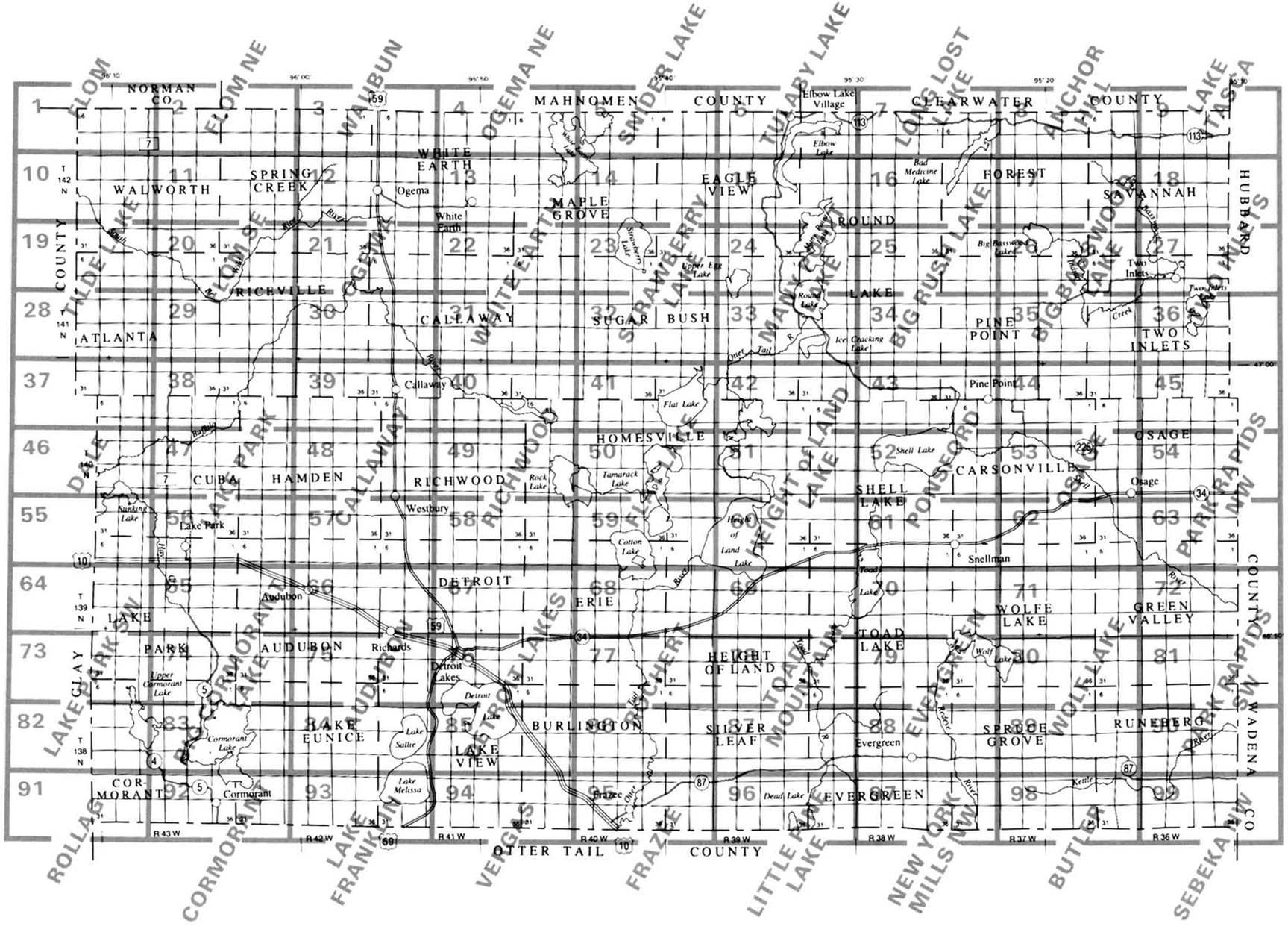
BECKER COUNTY, MINNESOTA

Scale 1:253440

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
BECKER COUNTY, MINNESOTA

Scale 1:253440

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS

SOIL LEGEND

Map symbols consist of a number or a combination of numbers and a letter. The initial number represents the kind of soil. A capital letter following the number indicates a slope class. Symbols without a capital letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the map unit is moderately eroded.

SYMBOL	NAME
20B	Chapett fine sandy loam, 2 to 8 percent slopes
20C2	Chapett fine sandy loam, 8 to 15 percent slopes, eroded
20E	Chapett fine sandy loam, 15 to 30 percent slopes
26	Aazdahl clay loam
33B	Barnes loam, 2 to 6 percent slopes
36	Flom silty clay loam
38B	Waukon loam, 2 to 8 percent slopes
38C	Waukon loam, 8 to 15 percent slopes
38E	Waukon loam, 15 to 30 percent slopes
40B	Nebish loam, 2 to 8 percent slopes
40C	Nebish loam, 8 to 15 percent slopes
40E	Nebish loam, 15 to 30 percent slopes
47	Colvin silty clay loam
63	Rockwell loam
108	McIntosh silt loam
111	Hangaard sandy loam
121	Wykeham fine sandy loam
125	Beltrami loam
133A	Dalbo silt loam, 0 to 2 percent slopes
133B	Dalbo silt loam, 2 to 8 percent slopes
133C	Dalbo silt loam, 8 to 15 percent slopes
133E	Dalbo silt loam, 15 to 30 percent slopes
137	Dovray silty clay
141B	Egeland fine sandy loam, 1 to 6 percent slopes
141C	Egeland fine sandy loam, 6 to 12 percent slopes
168B	Forman clay loam, 2 to 6 percent slopes
168C2	Forman clay loam, 6 to 12 percent slopes, eroded
168D2	Forman clay loam, 12 to 20 percent slopes, eroded
168E	Forman clay loam, 20 to 30 percent slopes
171B	Formdale clay loam, 2 to 5 percent slopes
180	Gonvick loam
184	Hamerly loam
191	Epoufette sandy loam
202	Meehan loamy sand
207D	Nymore loamy sand, 12 to 20 percent slopes
267B	Snellman sandy loam, 2 to 8 percent slopes
267C	Snellman sandy loam, 8 to 15 percent slopes
267E	Snellman sandy loam, 15 to 30 percent slopes
315A	Bootlake sandy loam, 0 to 2 percent slopes
315B	Bootlake sandy loam, 2 to 5 percent slopes
332B	Sugarbush sandy loam, 1 to 8 percent slopes
335	Urness mucky silt loam
339	Fordville loam
344	Quam silty clay loam
351	Colvin silty clay loam, depressional
375	Forada loam
398	Winger silty clay loam, depressional
406A	Dorset sandy loam, 0 to 2 percent slopes
406B	Dorset sandy loam, 2 to 6 percent slopes
413	Osakis sandy loam
418	Lamoure silty clay loam, occasionally flooded
422B	Bygland silty clay loam, 1 to 6 percent slopes
422C	Bygland silty clay loam, 6 to 15 percent slopes
503B	Balmlake fine sandy loam, 1 to 8 percent slopes
503C	Balmlake fine sandy loam, 8 to 15 percent slopes
503E	Balmlake fine sandy loam, 15 to 30 percent slopes
508	Wyndmere fine sandy loam
540	Seelyeville muck
541	Rifle mucky peat
544	Cathro muck
564	Friendship loamy sand
567A	Verndale sandy loam, 0 to 2 percent slopes
567B	Verndale sandy loam, 2 to 6 percent slopes
579C2	Formdale-Langhei-Sandberg complex, 6 to 12 percent slopes, eroded
624	Rosy sandy loam
701	Runeberg mucky loam, depressional
711B	Arvilla-Sandberg complex, 2 to 6 percent slopes
711C	Arvilla-Sandberg complex, 6 to 12 percent slopes
718B	Naytahwaush loam, 2 to 8 percent slopes
718C	Naytahwaush loam, 8 to 15 percent slopes
718E	Naytahwaush loam, 15 to 30 percent slopes
721E	Corliss loamy sand, 20 to 35 percent slopes
746	Haslie muck
747B	Audubon silty clay loam, 0 to 6 percent slopes
753D	Abbeylake loamy sand, 12 to 20 percent slopes
753E	Abbeylake loamy sand, 20 to 30 percent slopes
765	Smiley loam
767	Auganaush loam
775B	Sugarbush-Two Inlets complex, 1 to 8 percent slopes
775C	Sugarbush-Two Inlets complex, 8 to 15 percent slopes
776B	Snellman-Sugarbush complex, 2 to 8 percent slopes
776C	Snellman-Sugarbush complex, 8 to 15 percent slopes
776E	Snellman-Sugarbush complex, 15 to 30 percent slopes
778B	Dorset-Corliss complex, 1 to 6 percent slopes
778C	Dorset-Corliss complex, 6 to 12 percent slopes
780B	Audubon-Boyerlake complex, 1 to 6 percent slopes
780C2	Audubon-Boyerlake complex, 6 to 12 percent slopes, eroded
780D2	Audubon-Boyerlake complex, 12 to 20 percent slopes, eroded
785	Hamerly-Winger complex
786	Winger-Hamerly-Colvin complex
797	Mooselake and Lupton soils
867B	Graycalm-Menahga complex, 1 to 8 percent slopes
867C	Graycalm-Menahga complex, 8 to 15 percent slopes
867E	Graycalm-Menahga complex, 15 to 30 percent slopes
903B	Barnes-Langhei complex, 2 to 6 percent slopes
903C2	Barnes-Langhei complex, 6 to 12 percent slopes, eroded
931C2	Formdale-Langhei complex, 6 to 12 percent slopes, eroded
942D2	Langhei-Barnes complex, 12 to 20 percent slopes, eroded
943D2	Langhei-Formdale complex, 12 to 20 percent slopes, eroded
943E	Langhei-Formdale complex, 20 to 30 percent slopes
951B	Nebish-Sugarbush complex, 2 to 8 percent slopes
951C	Nebish-Sugarbush complex, 8 to 15 percent slopes
951E	Nebish-Sugarbush complex, 15 to 30 percent slopes
1015	Udipsamments, cut and fill land
1016	Udorthents, loamy, cut and fill land
1027	Udorthents, wet substratum, fill land
1030	Pits, gravel-Udipsamments complex
1104B	Waukon-Dorset complex, 1 to 8 percent slopes
1104C	Waukon-Dorset complex, 8 to 15 percent slopes
1111	Nidaros muck, frequently flooded
1113	Haslie, Seelyeville, and Cathro soils, ponded
1125B	Sverdrup-Abbeylake complex, 1 to 6 percent slopes
1125C	Sverdrup-Abbeylake complex, 6 to 12 percent slopes
1126B	Verndale-Nymore complex, 1 to 6 percent slopes
1127A	Bootlake-Graycalm complex, 0 to 2 percent slopes
1127B	Bootlake-Graycalm complex, 2 to 8 percent slopes
1128	Cathro muck, frequently flooded
1129	Lindaas silty clay loam, morainic
1130	Wolverton fine sandy loam
1131B	Verndale-Abbeylake complex, 1 to 6 percent slopes
1132B	Eagleview-Balmlake complex, 1 to 8 percent slopes
1132C	Eagleview-Balmlake complex, 8 to 15 percent slopes
1132E	Eagleview-Balmlake complex, 15 to 30 percent slopes
1135	Foxlake silty clay loam
1136	Nidaros muck
1137B	Birchlake silty clay loam, 1 to 6 percent slopes
1137C2	Birchlake silty clay loam, 6 to 12 percent slopes, eroded
1137D2	Birchlake silty clay loam, 12 to 20 percent slopes, eroded
1137E	Birchlake silty clay loam, 20 to 30 percent slopes
1138	Rushlake and Hangaard soils, lake beaches
1140B	Eagleview-Snellman complex, 1 to 8 percent slopes
1140C	Eagleview-Snellman complex, 8 to 15 percent slopes
1149	Hamerly clay loam
1195B	Sybil-Eagleview complex, 2 to 8 percent slopes
1195C	Sybil-Eagleview complex, 8 to 15 percent slopes
1195E	Sybil-Eagleview complex, 15 to 30 percent slopes
1196B	Lida-Two Inlets complex, 1 to 8 percent slopes
1196C	Lida-Two Inlets complex, 8 to 15 percent slopes
1196E	Lida-Two Inlets complex, 15 to 30 percent slopes
1200	Egglake loam
1201C	Sugarbush-Snellman complex, 8 to 15 percent slopes
1201E	Sugarbush-Snellman complex, 15 to 35 percent slopes
1210	Paddock-Epoufette complex
1211	Egglake-Cathro complex
1225	Wykeham-Karlstad complex
1227	Quam, Cathro, and Urness soils, ponded
1230	Haslie and Nidaros soils, ponded
1234B	Formdale-Buse complex, 2 to 6 percent slopes
1235B	Formdale-Buse-Sandberg complex, 2 to 6 percent slopes
1236B	Eagleview loamy sand, 1 to 8 percent slopes
1236C	Eagleview loamy sand, 8 to 15 percent slopes
1236E	Eagleview loamy sand, 15 to 30 percent slopes
1238E	Two Inlets-Sugarbush complex, 15 to 30 percent slopes
1242D	Sandberg-Arvilla complex, 12 to 20 percent slopes
1243B	Sol sandy loam, 2 to 8 percent slopes, very stony
1243C	Sol sandy loam, 8 to 15 percent slopes, very stony
1243E	Sol sandy loam, 15 to 30 percent slopes, very stony
1244B	Sol-Sugarbush complex, 2 to 8 percent slopes, very stony
1244C	Sol-Sugarbush complex, 8 to 15 percent slopes, very stony
1244E	Sol-Sugarbush complex, 15 to 30 percent slopes, very stony
1246	Winger silty clay loam
1247D	Corliss-Dorset complex, 12 to 20 percent slopes
1248C	Nymore-Verndale complex, 6 to 12 percent slopes
1249C	Graycalm-Bootlake complex, 8 to 15 percent slopes
1250C	Abbeylake-Verndale complex, 6 to 12 percent slopes
1251	Lamoure silt loam, channeled, frequently flooded
1252B	Bootlake-Eagleview complex, 1 to 8 percent slopes
1263C	Eagleview-Bootlake complex, 8 to 15 percent slopes
1291	Sedgeville loam, frequently flooded
1306	Karlstad sandy loam
1317	Vallers silty clay loam
1318	Darnen loam
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony
1319C	Rockwood sandy loam, 6 to 12 percent slopes, stony
1319D	Rockwood sandy loam, 12 to 20 percent slopes, stony
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony
1321	Paddock fine sandy loam, stony
1365	Hillview fine sandy loam
1825B	Seelyeville muck, seep land, 1 to 10 percent slopes
1878	Hamre muck
1938	Lakepark clay loam
1942	Forada mucky loam, depressional
1967	Hamerly-Vallers complex
1975	Oylen sandy loam
1997	Vallers-Hamerly-Winger complex

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK — 650 000 FEET

LAND DIVISION CORNERS (sections and land grants)

ROAD EMBLEMS & DESIGNATIONS

- Federal — 10
- State — 34

RAILROAD

DAMS

- Medium or small — water; w

PITS

- Gravel pit

WATER FEATURES

DRAINAGE

- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water; w

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 931C2; 765

ESCARPMENTS

- Other than bedrock (points down slope)

SHORT STEEP SLOPE

MISCELLANEOUS

- Gravelly spot
- Sandy spot
- Stony spot, very stony spot

SMALL AREA OF ORGANIC SOIL

SMALL AREA OF MINERAL SOIL IN ORGANIC SOILS

SMALL AREA OF COLLUVIUM

SMALL AREA OF CUT AND FILL

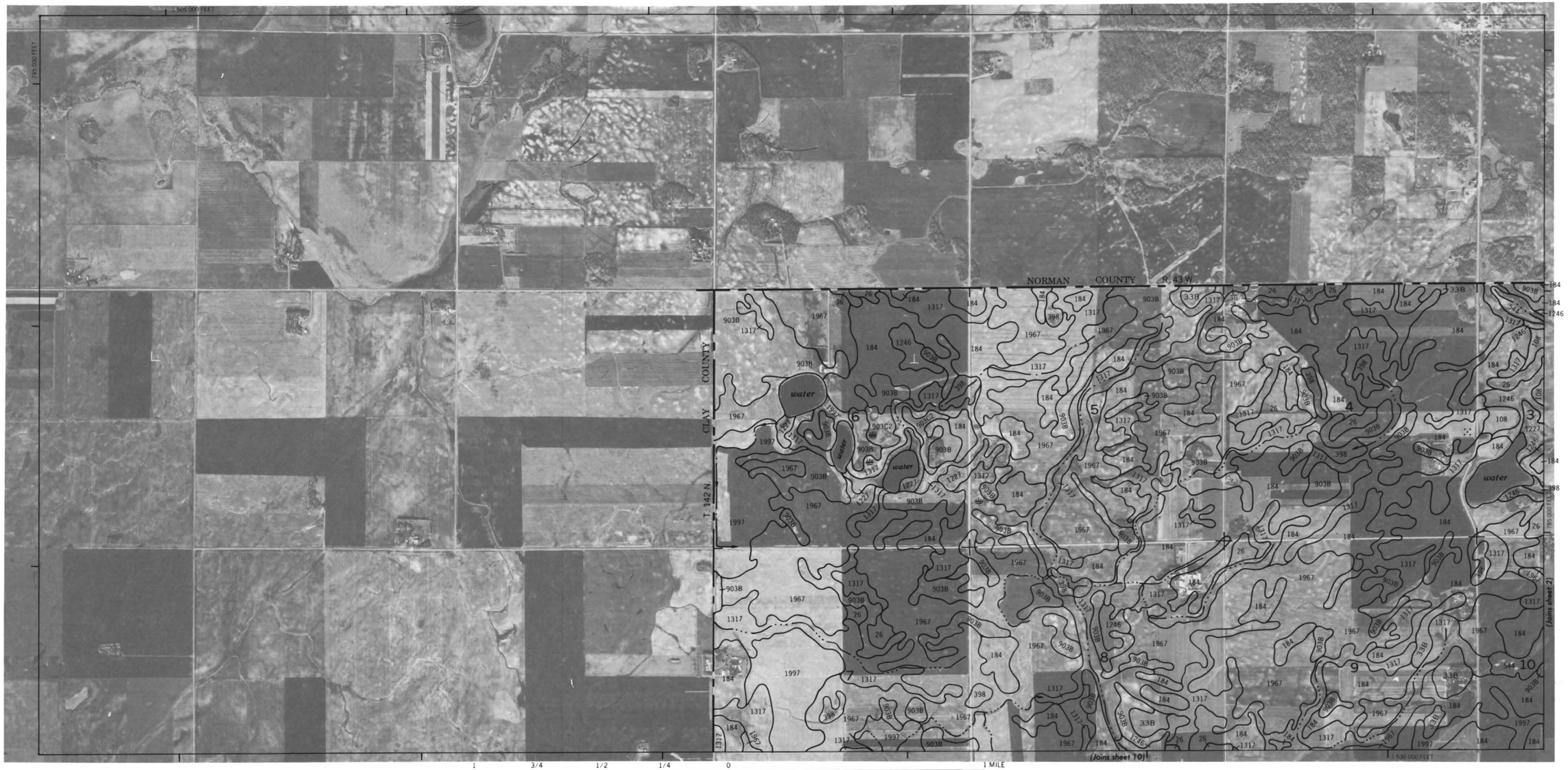
AREAS OF DENIED ACCESS

1

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 1



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 2

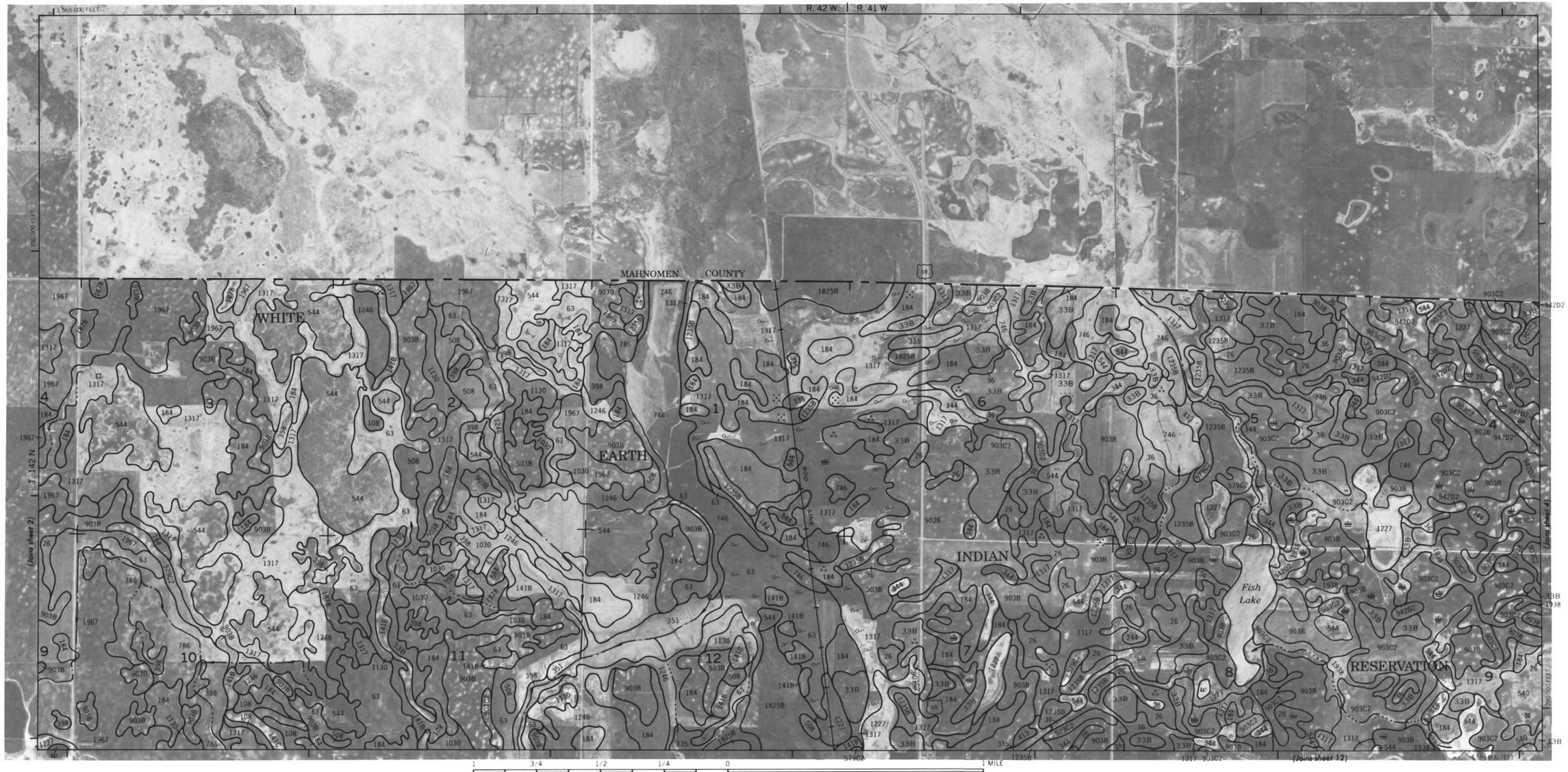
BECKER COUNTY MINNESOTA NO. 2

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 3



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

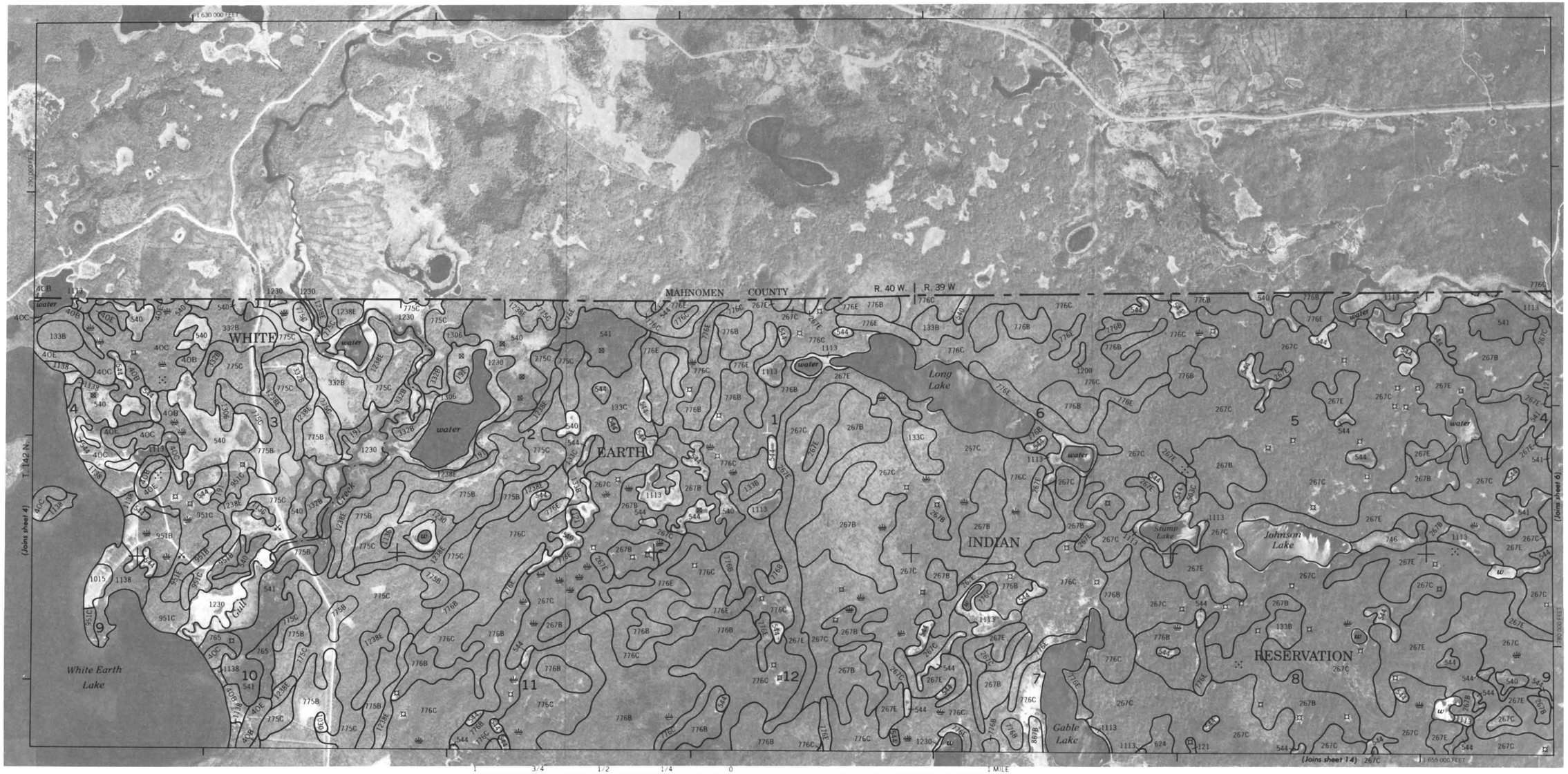
BECKER COUNTY MINNESOTA NO. 4

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

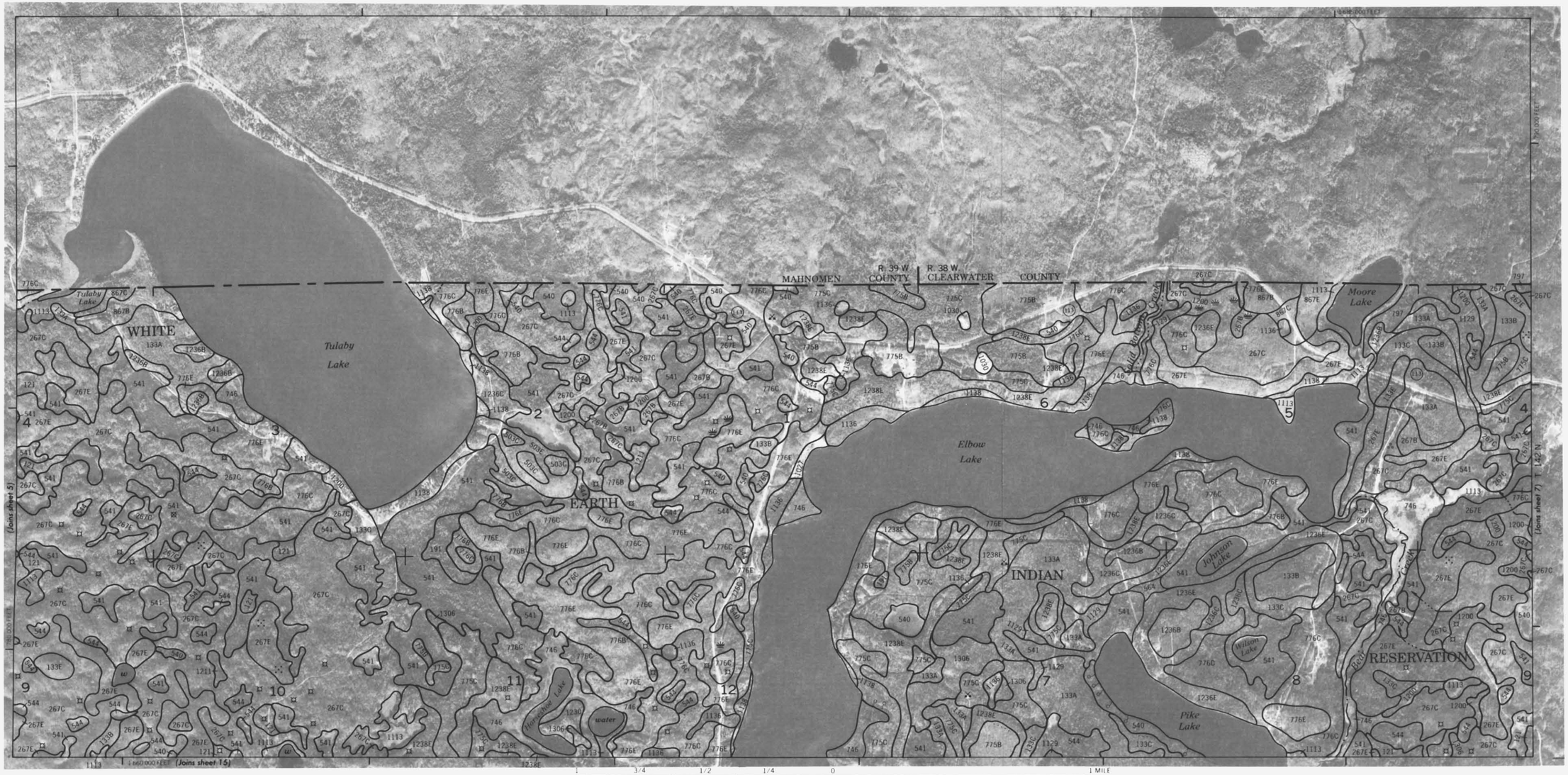
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 5



6

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 6

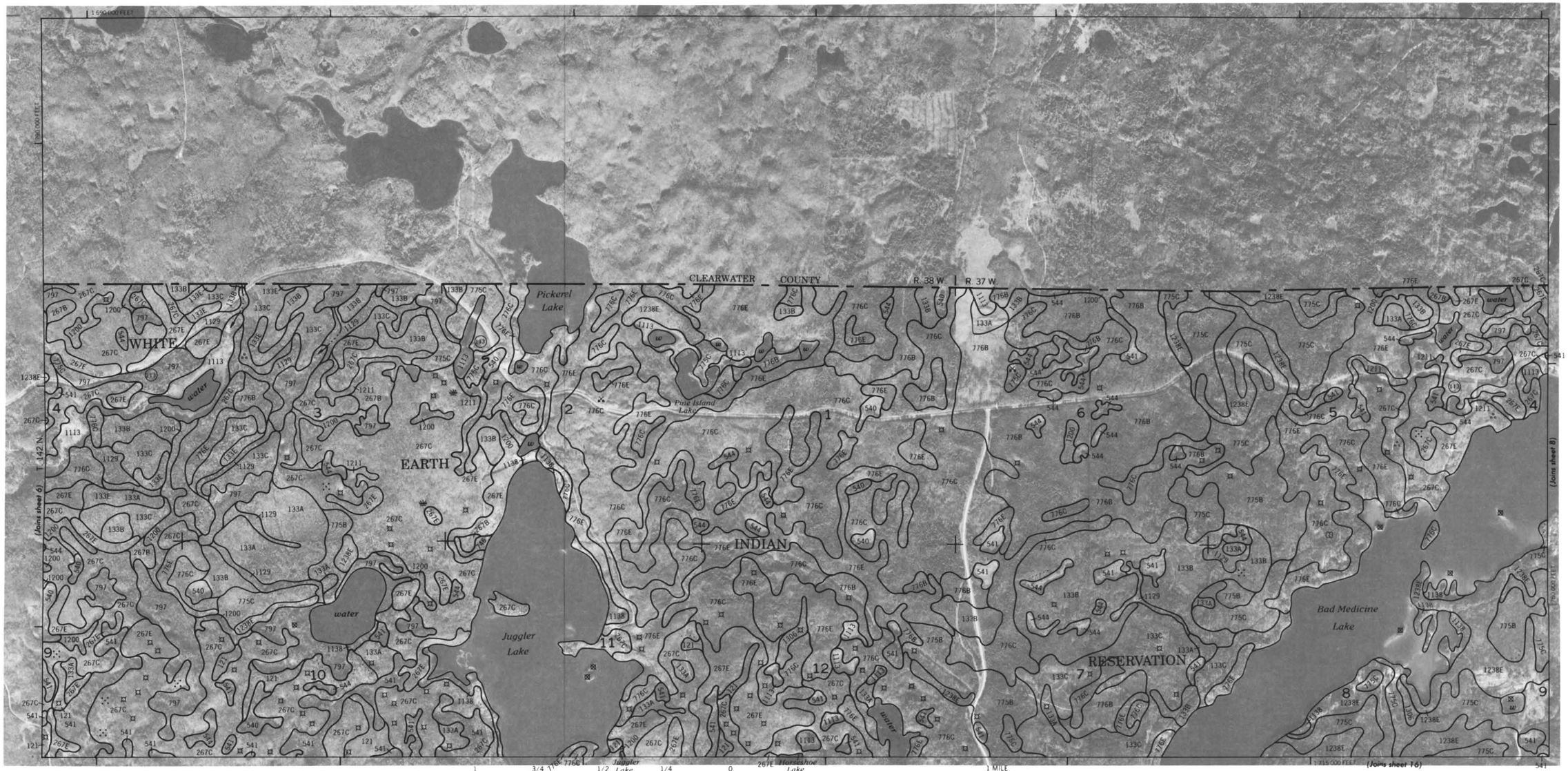
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7

N

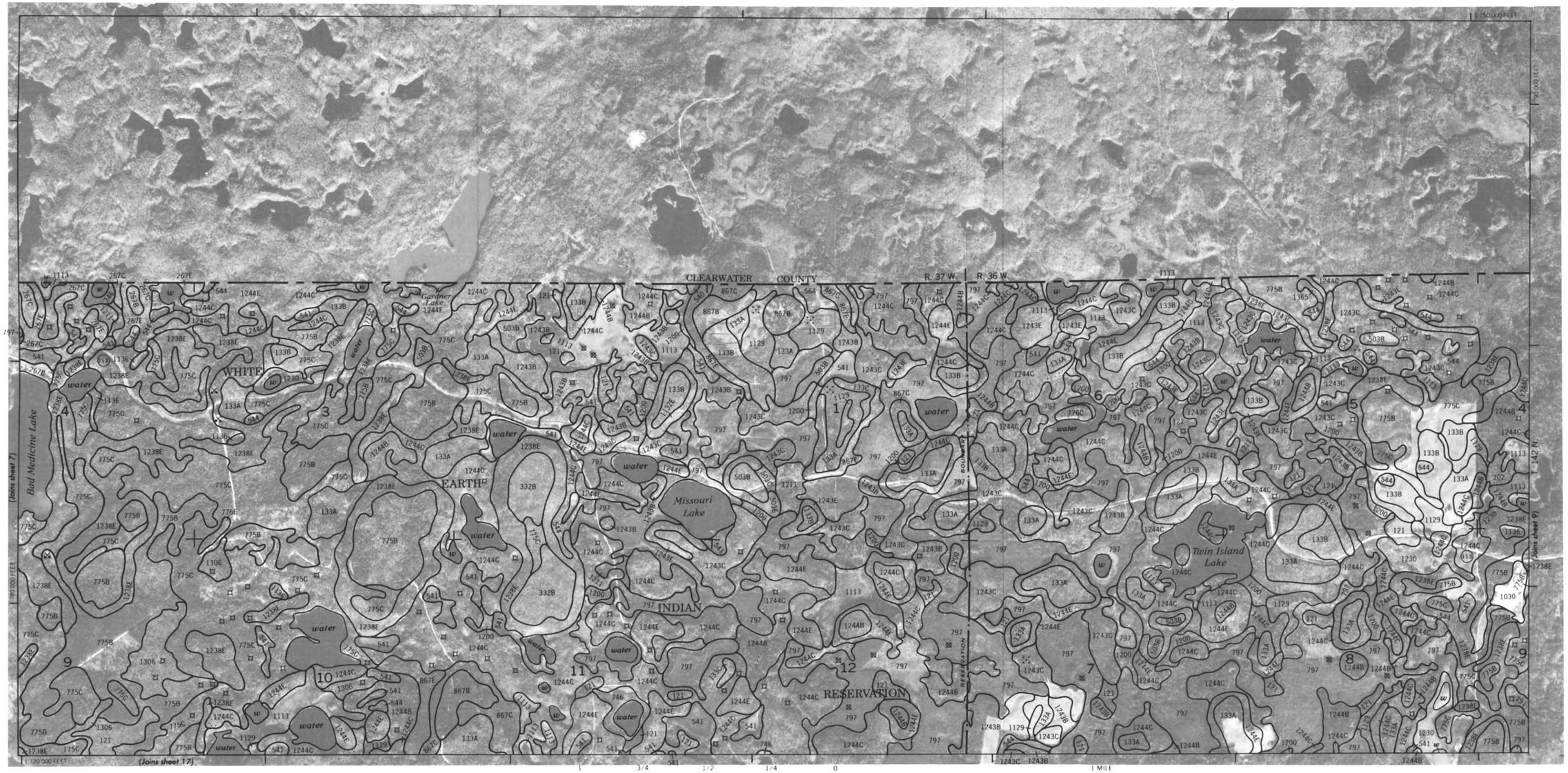
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are compared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 7



N

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 8



1 3/4 1/2 1/4 0 1 MILE

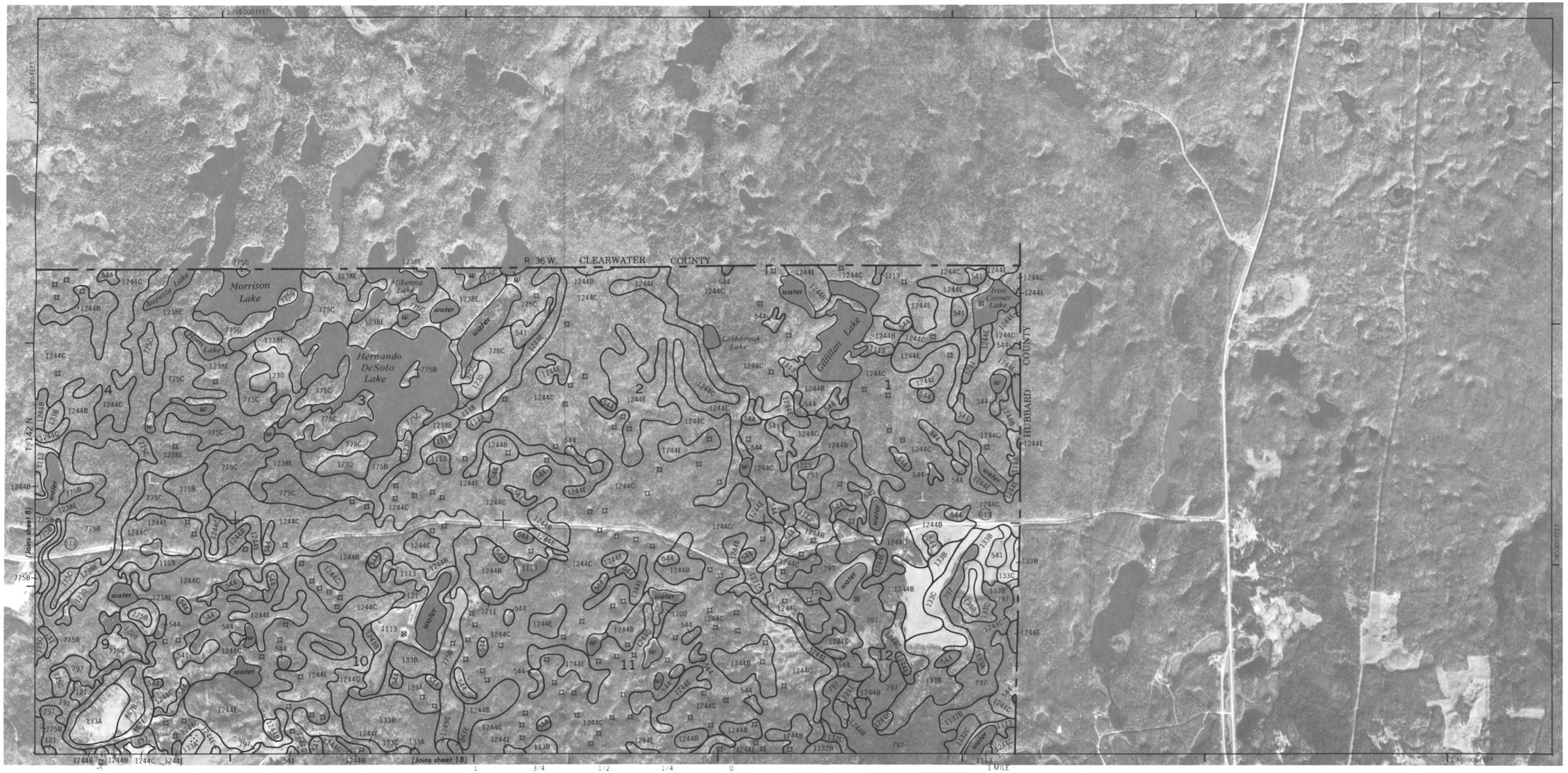
1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 8

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

10

N

1 3/4 1/2 1/4 0 1 MILE

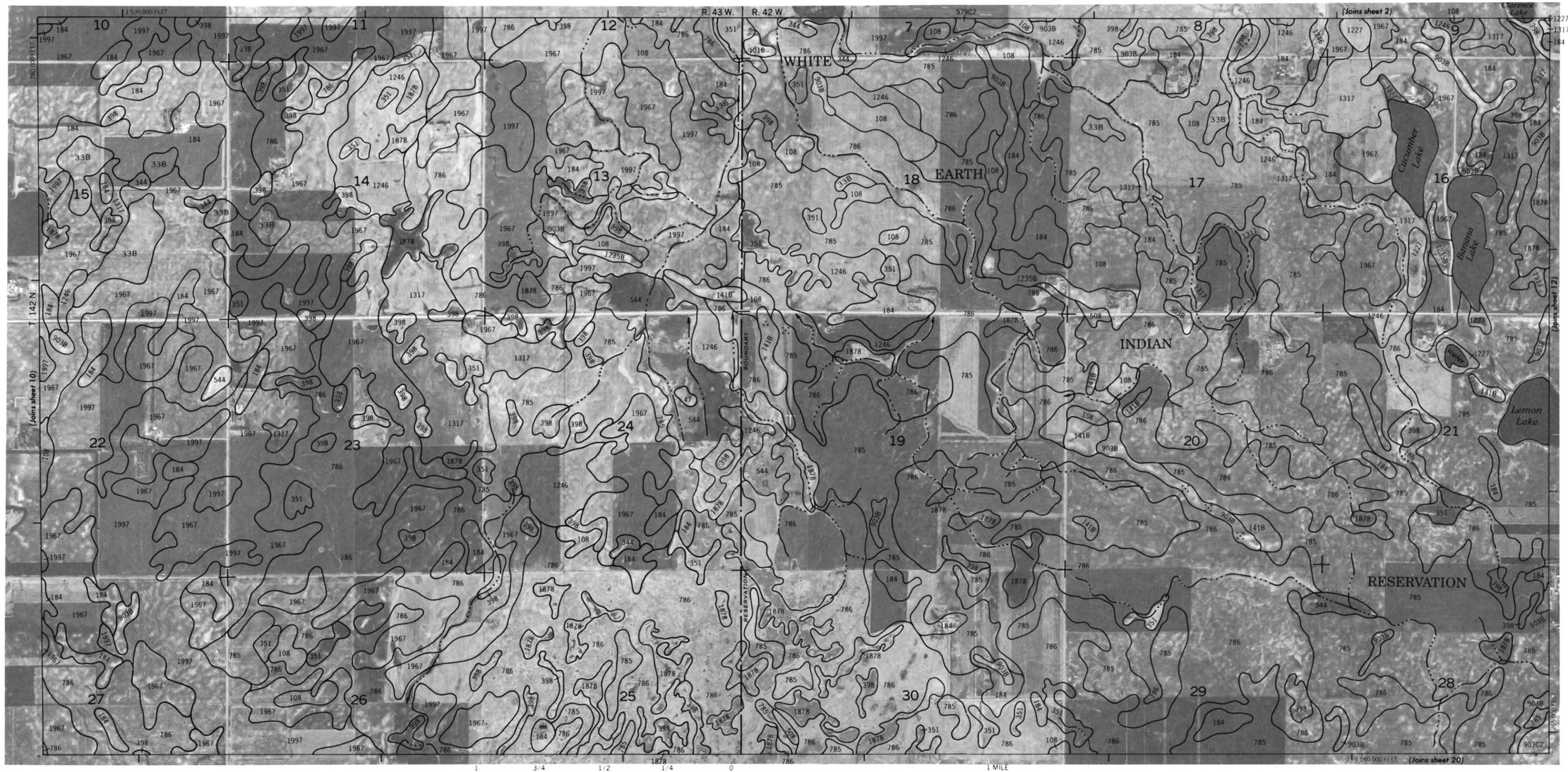
1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 10

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 11

N

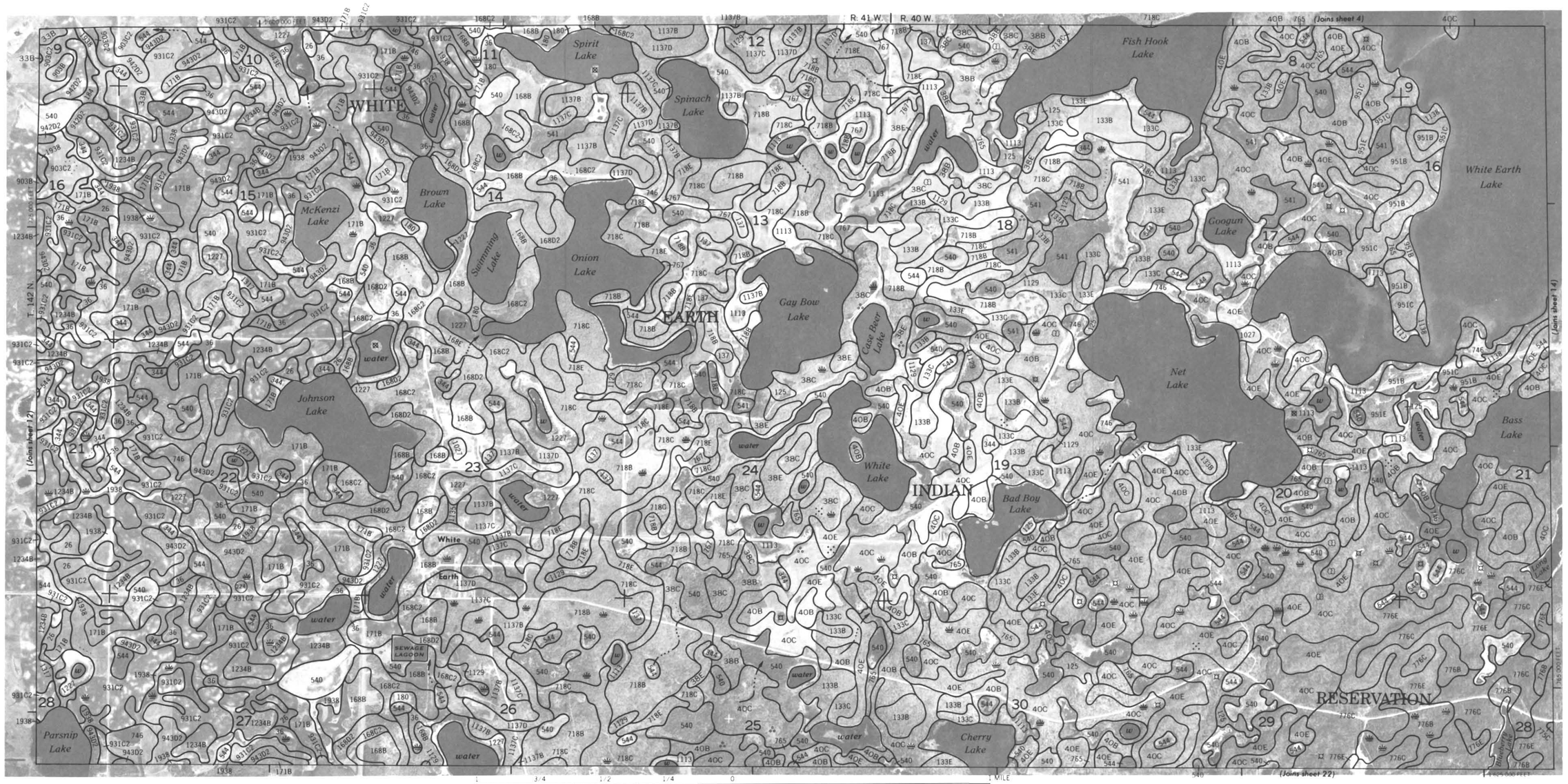
SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 12

BECKER COUNTY MINNESOTA NO. 12

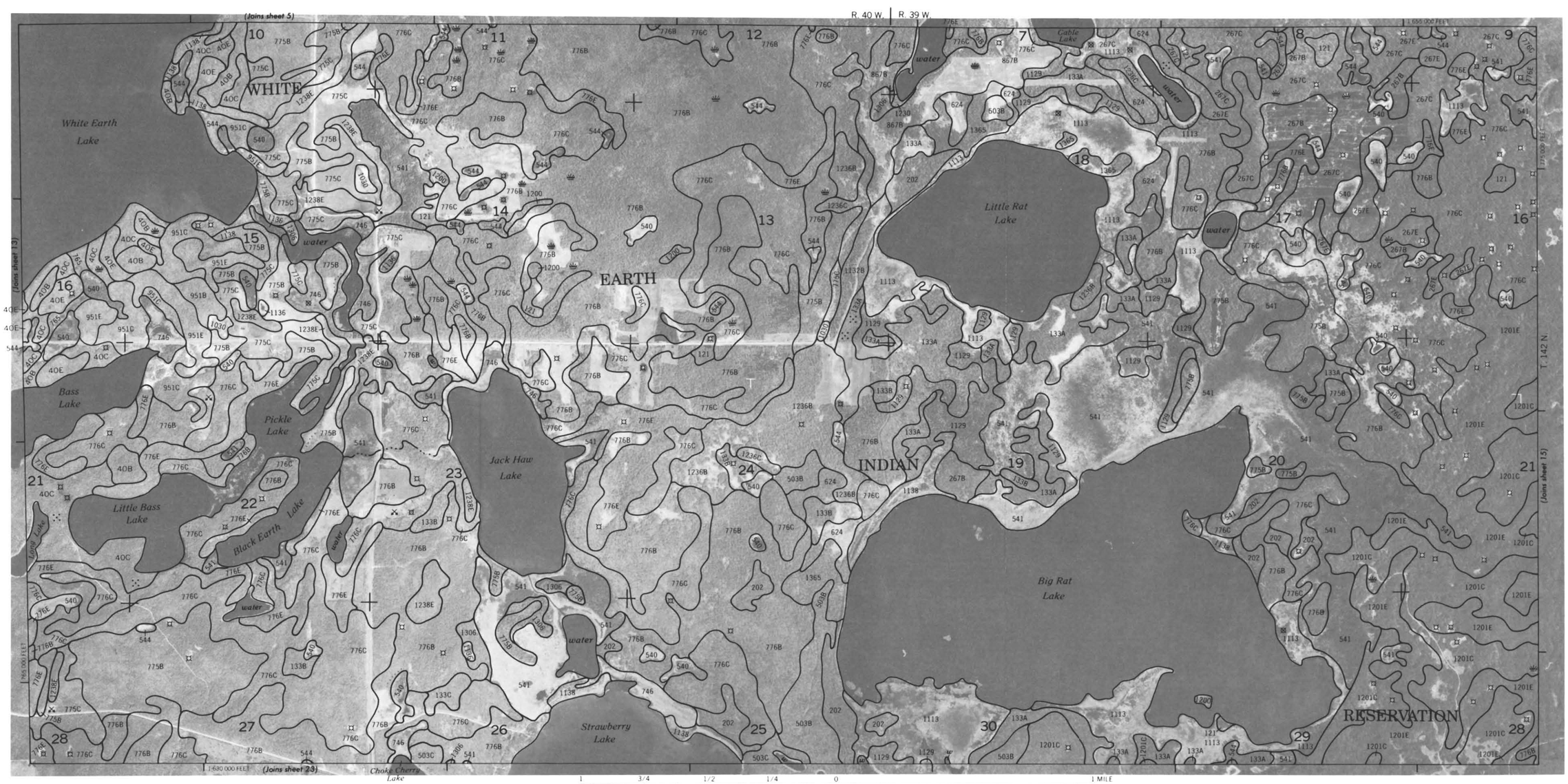
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 13



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 14



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

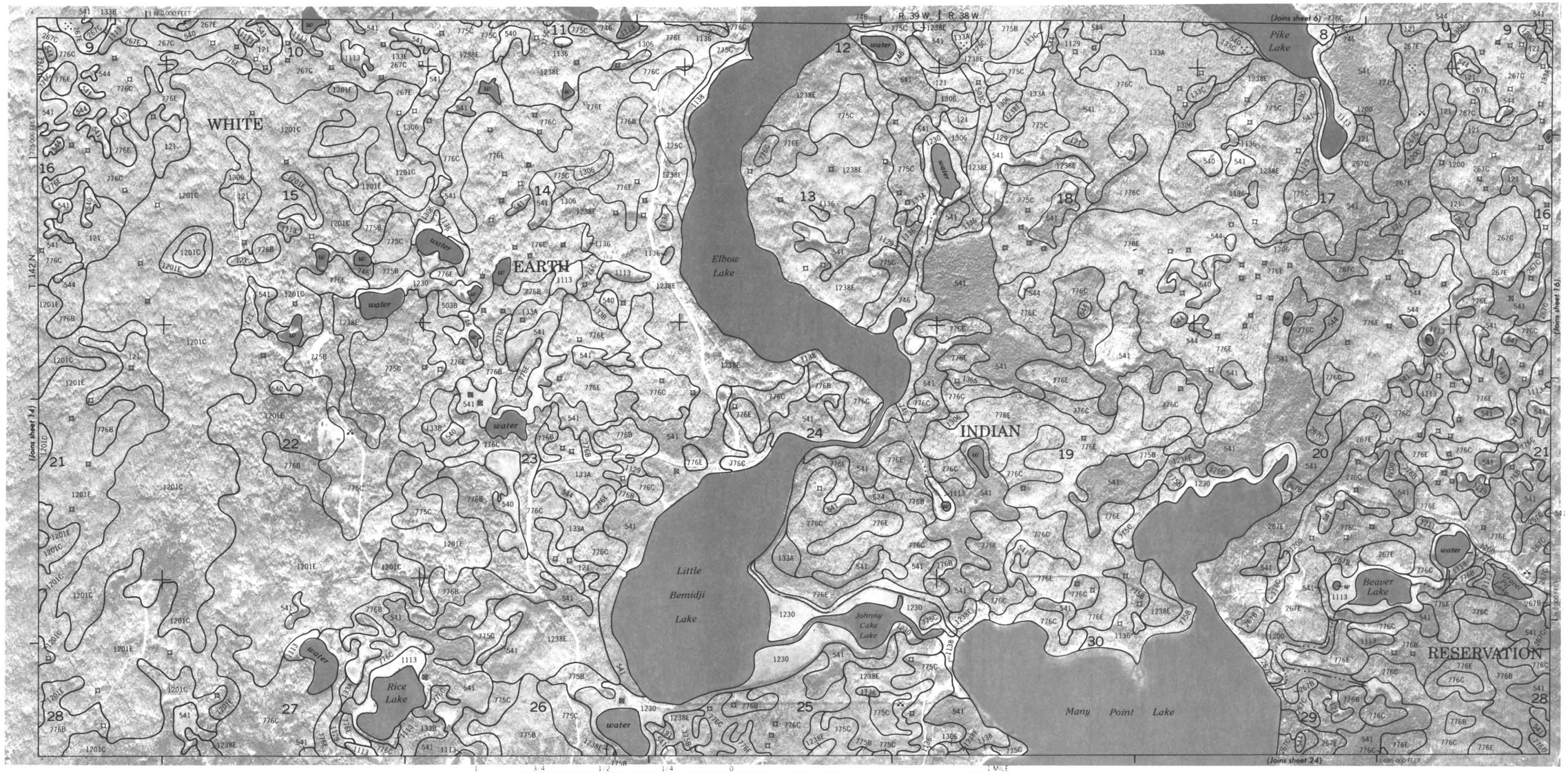
BECKER COUNTY MINNESOTA NO. 14

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 15

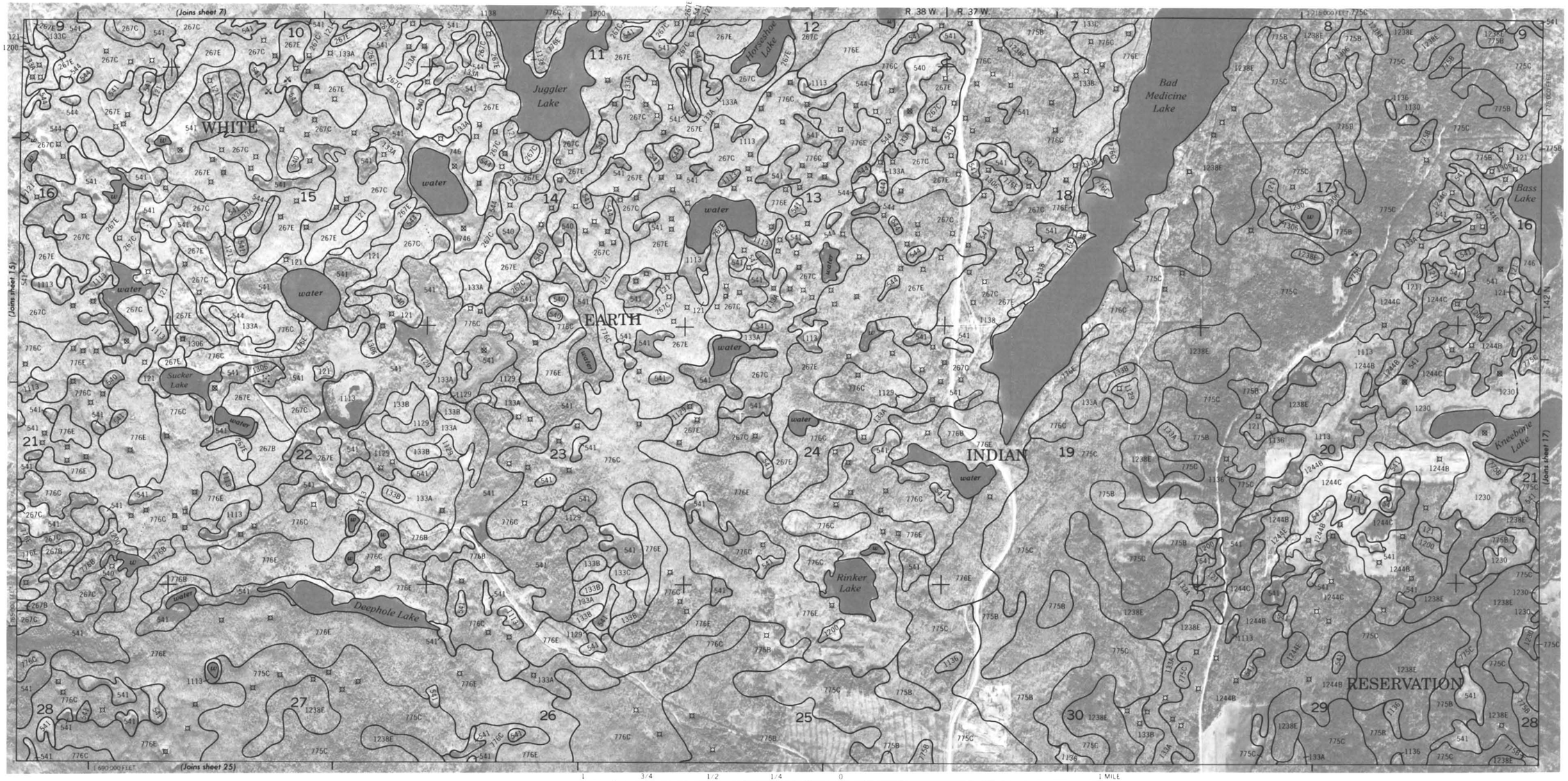


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

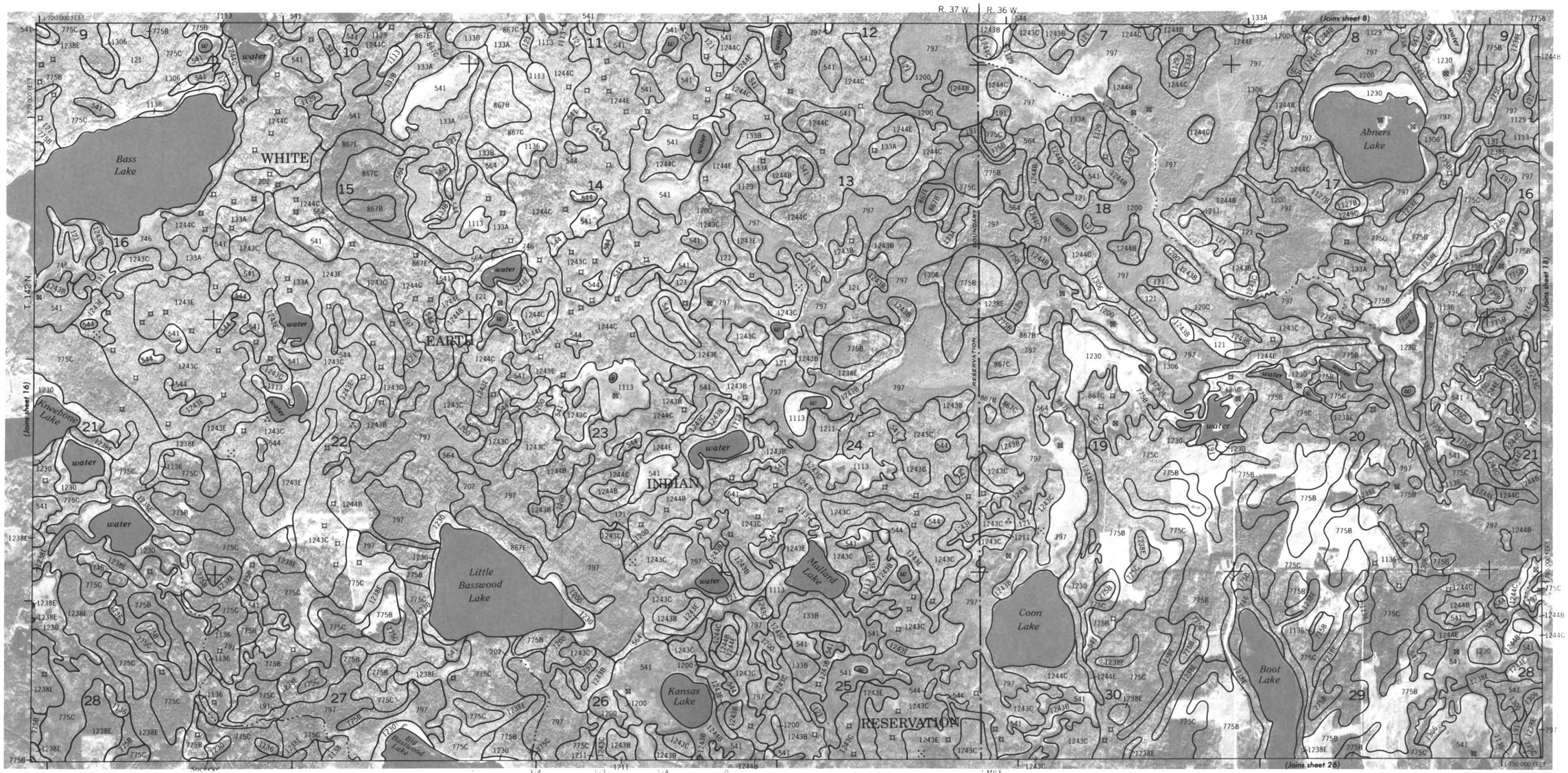
SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 16

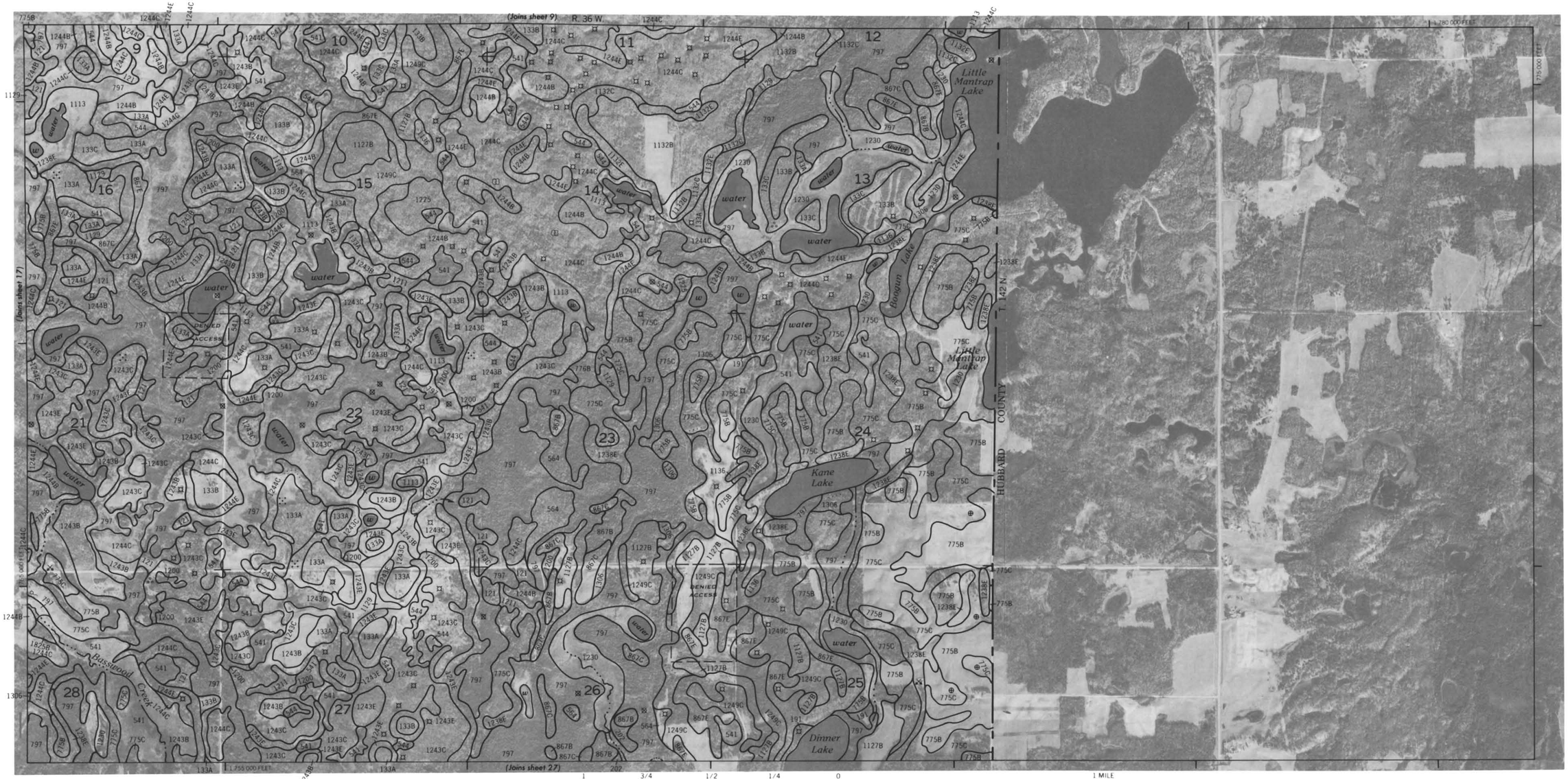
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

BECKER COUNTY MINNESOTA NO. 17



N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

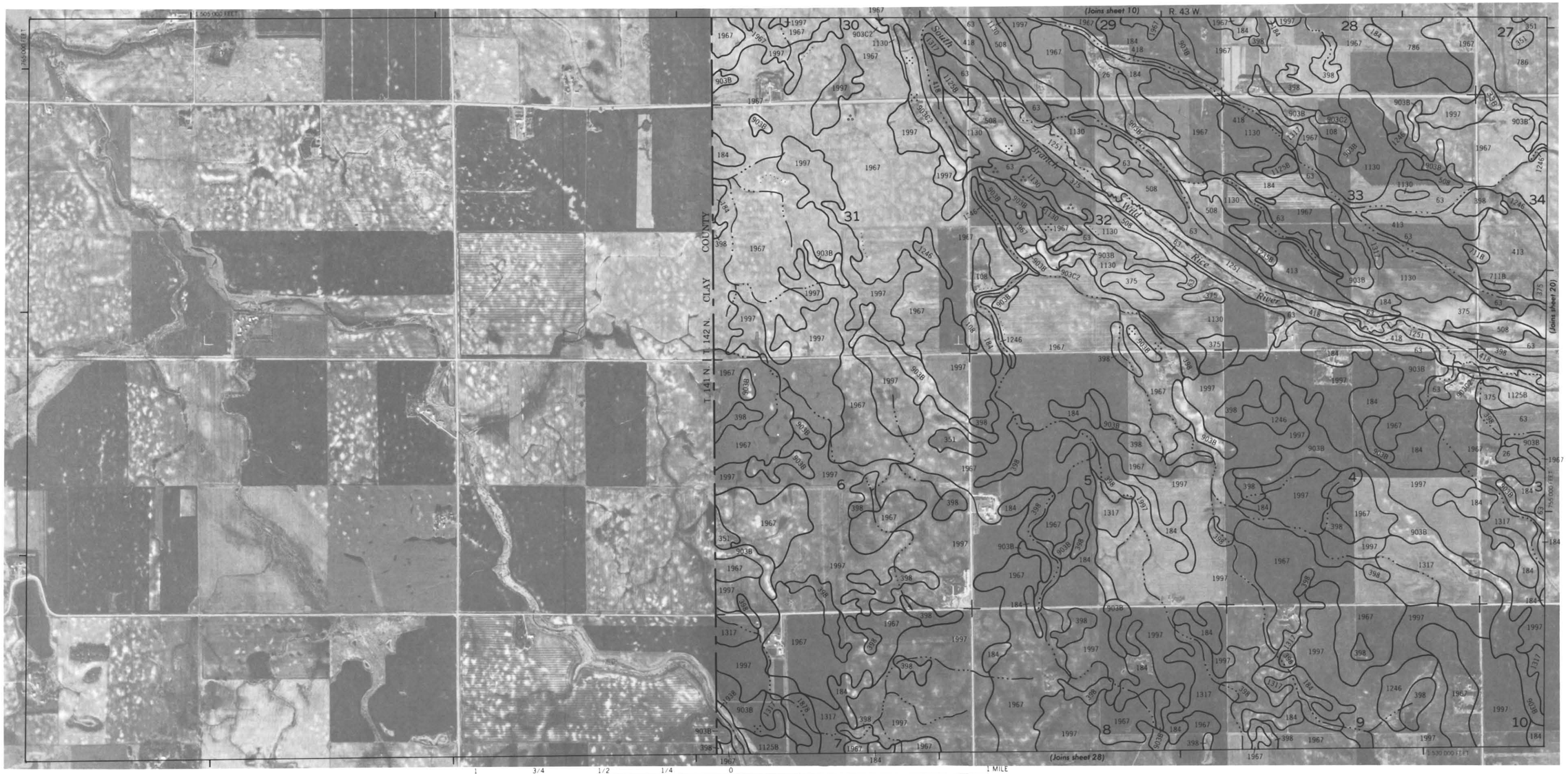
BECKER COUNTY MINNESOTA NO. 18

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

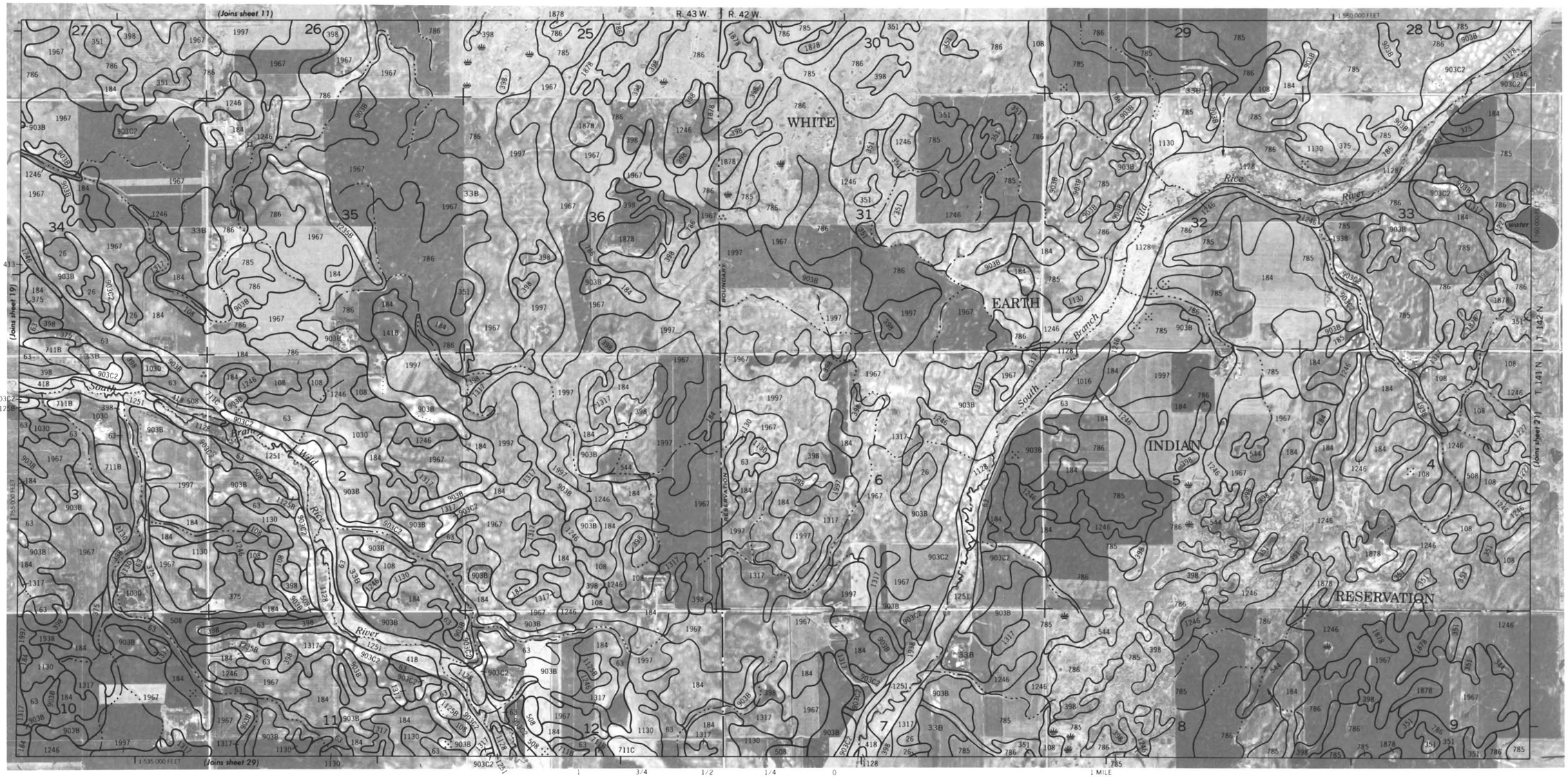
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 19



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 20

N



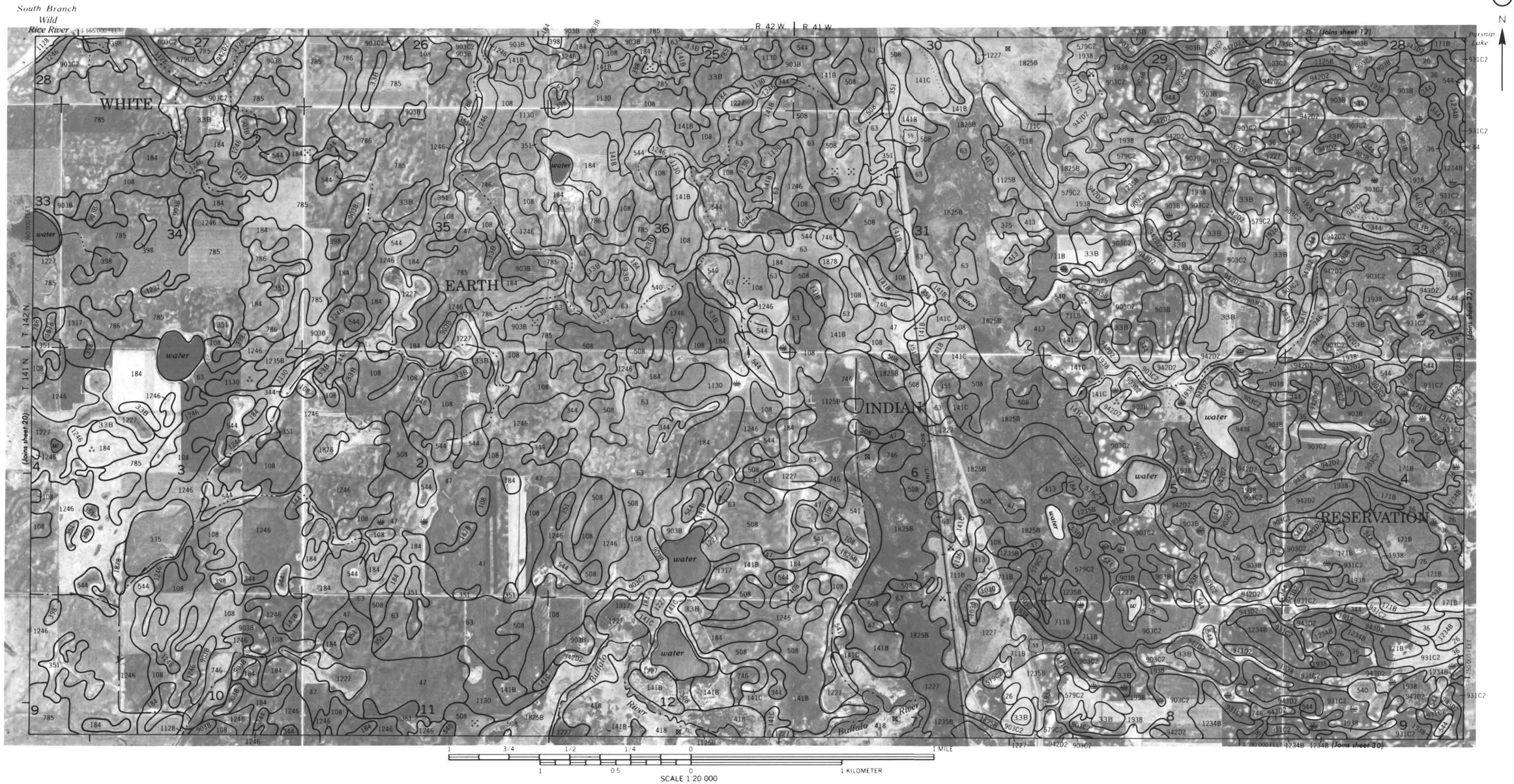
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 20

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are compiled from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 21

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 22

BECKER COUNTY MINNESOTA NO. 22

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

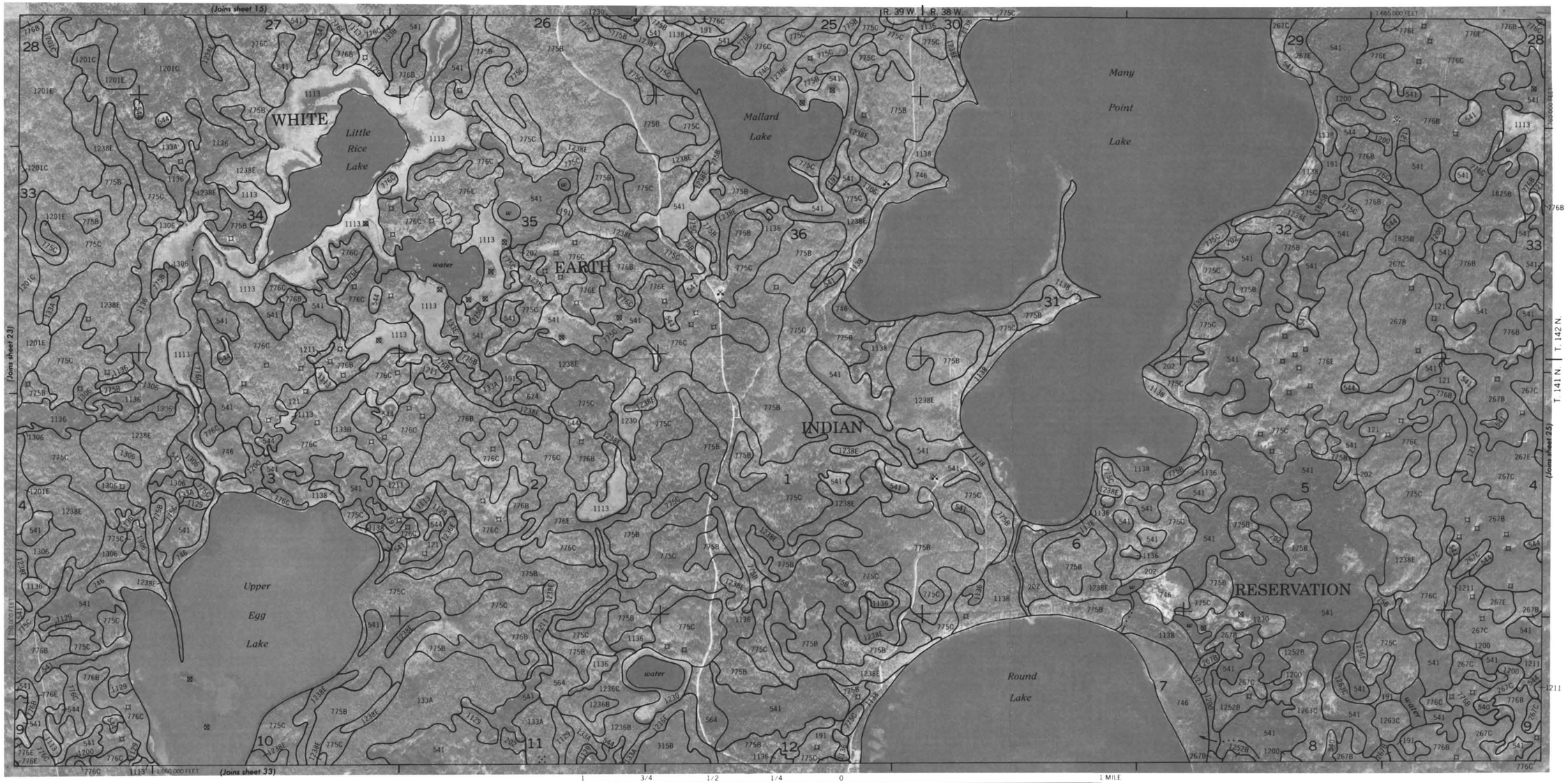
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 23

N

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 24



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 25

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

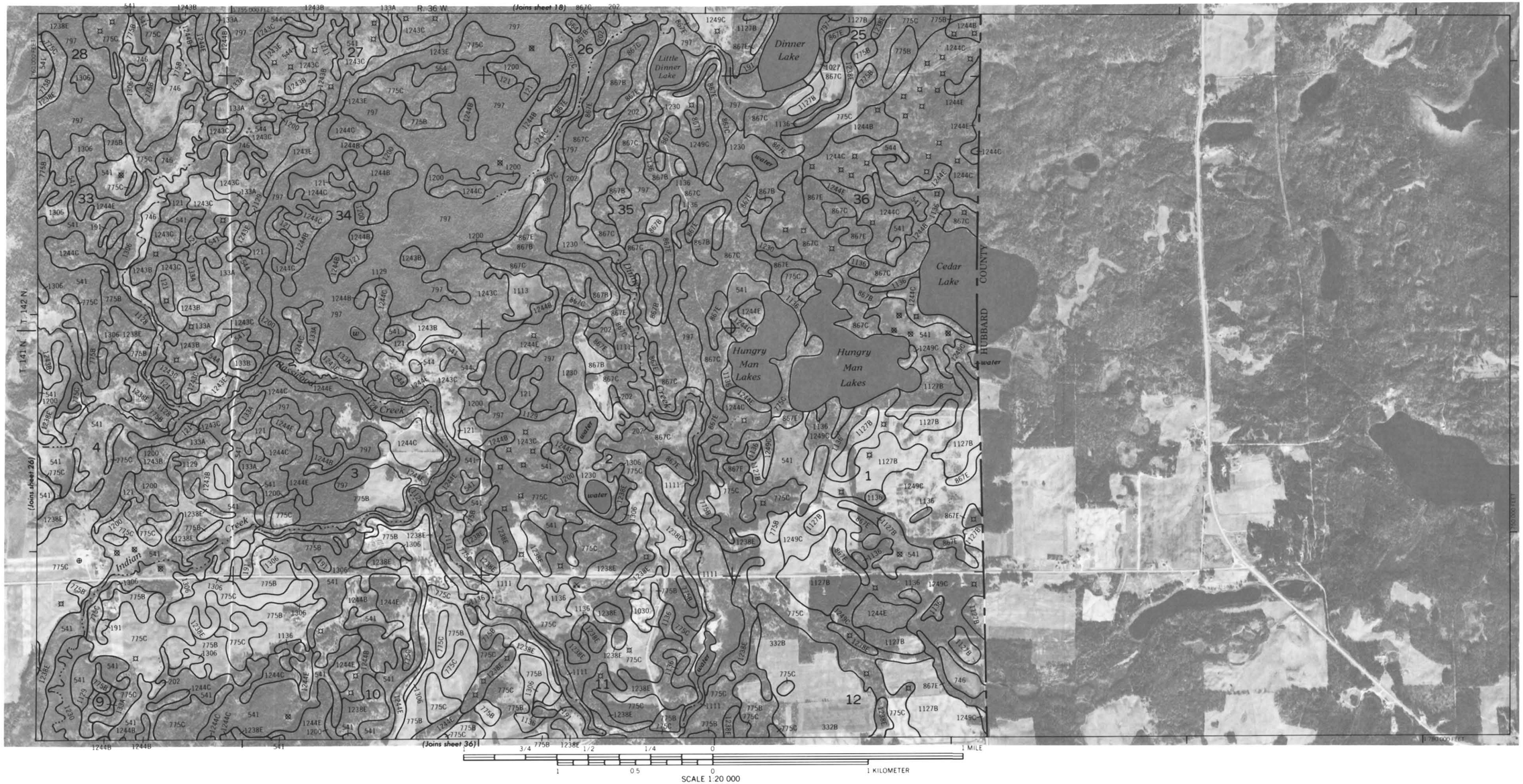
BECKER COUNTY MINNESOTA NO. 26

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

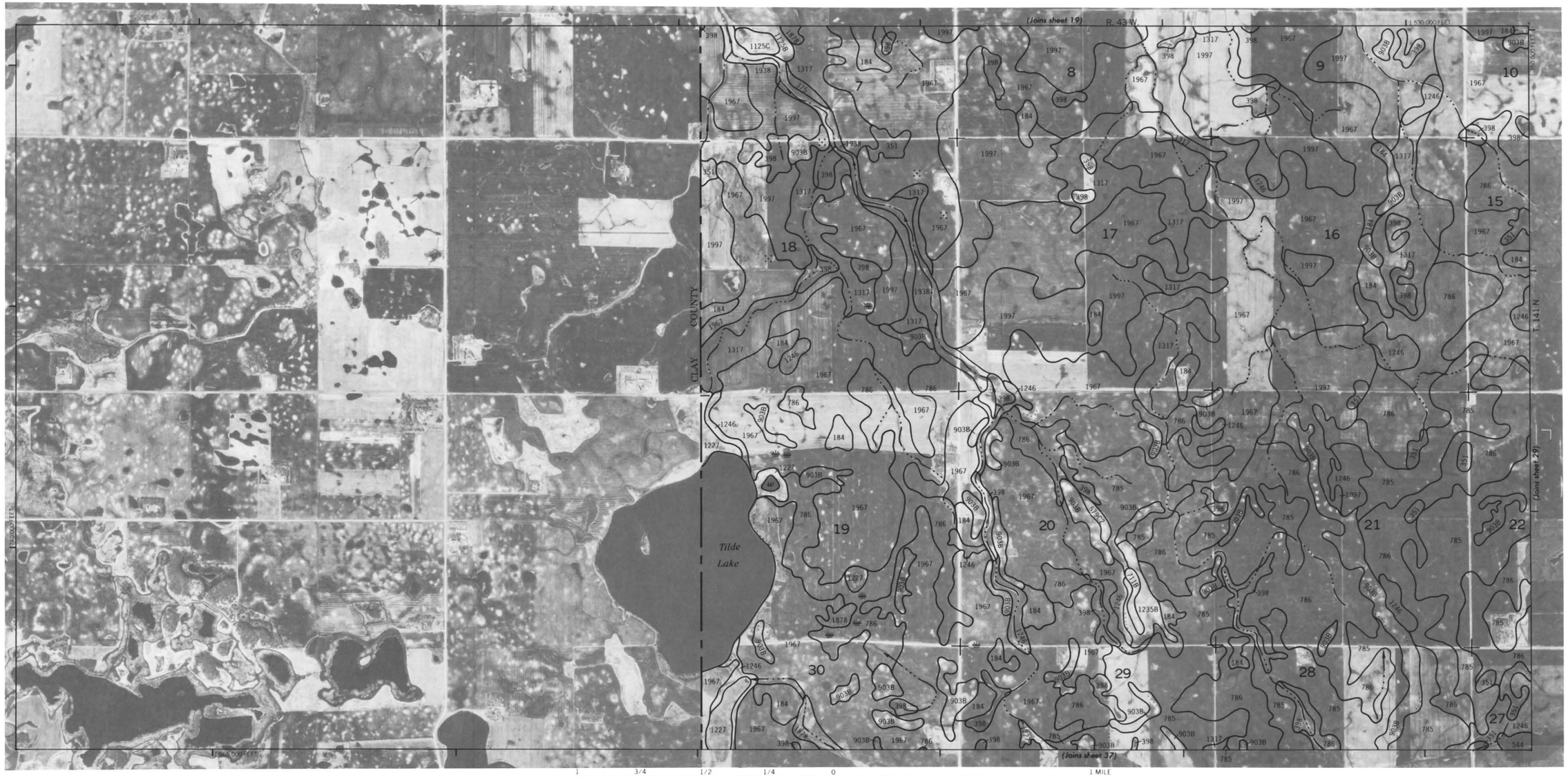
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 27



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 28

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

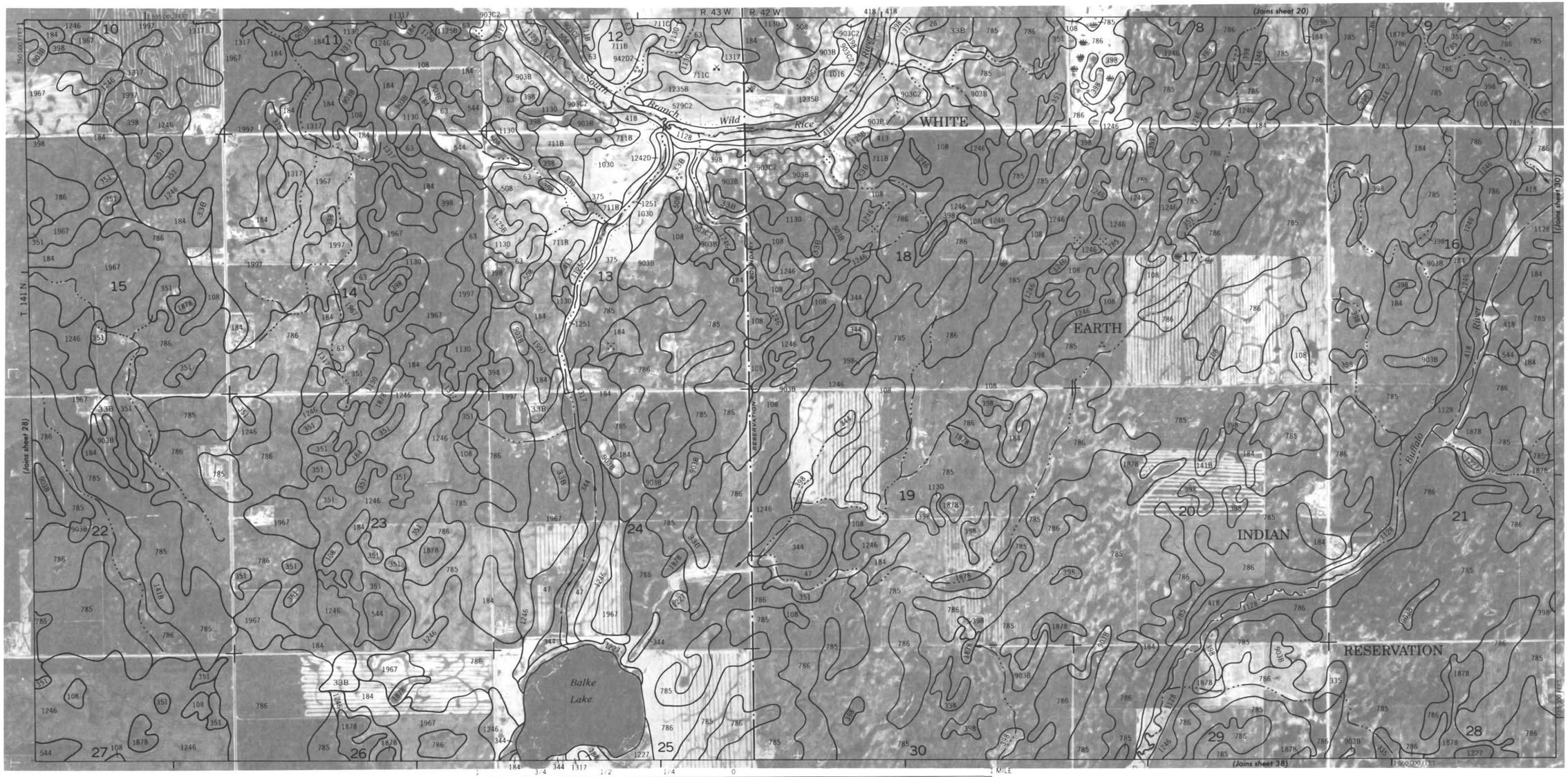
BECKER COUNTY MINNESOTA NO. 28

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

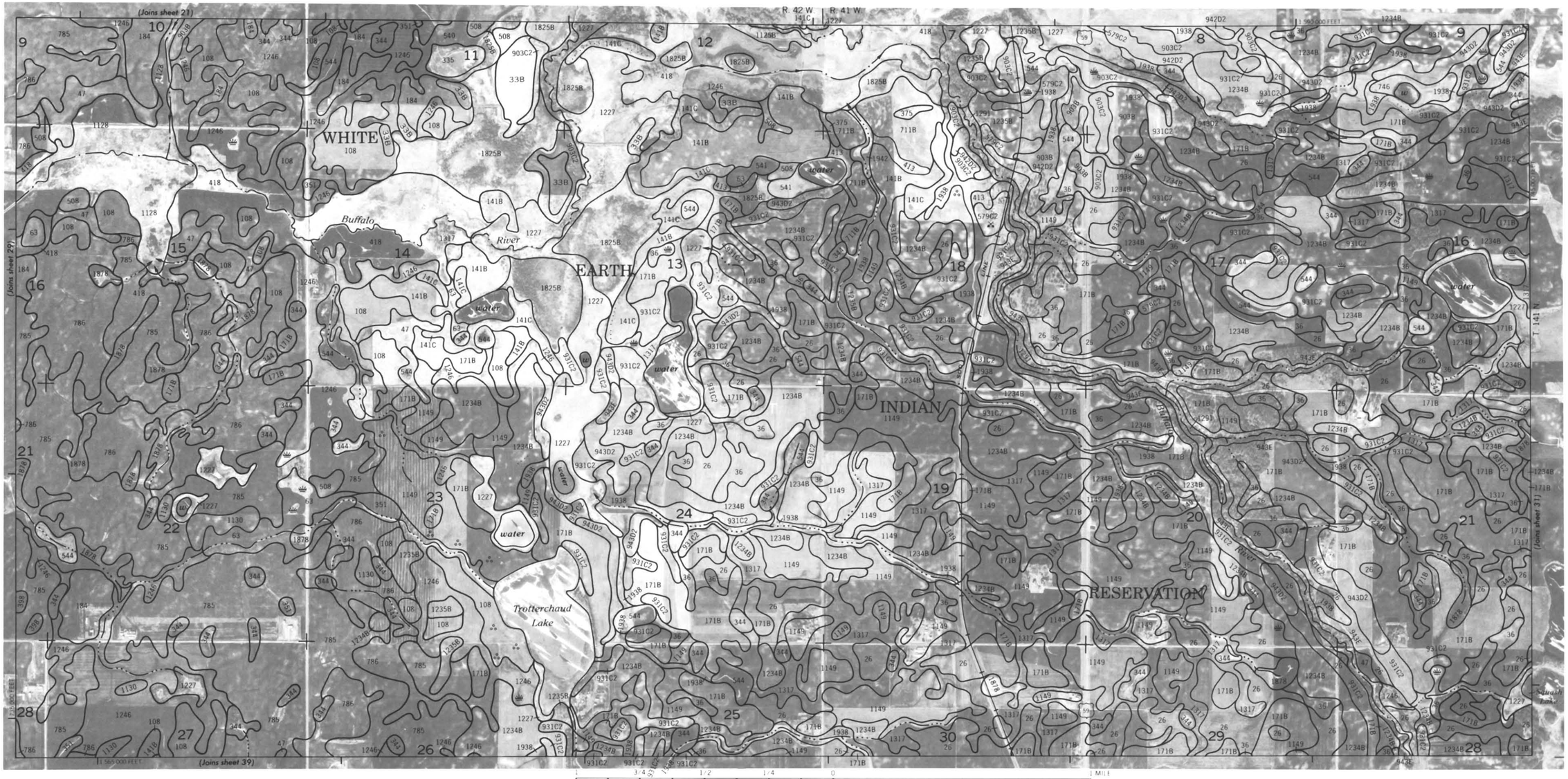
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 29



N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

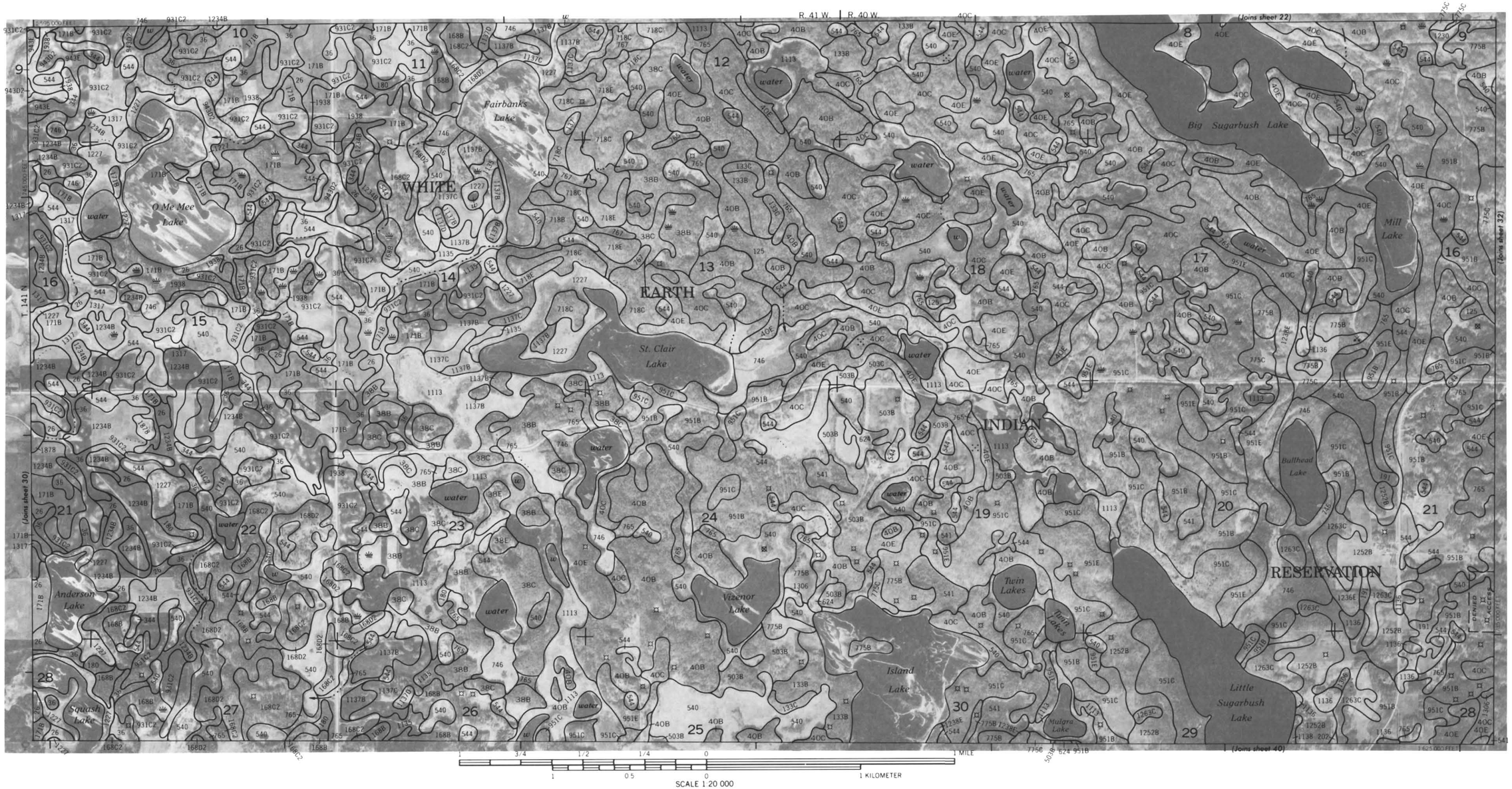
BECKER COUNTY MINNESOTA NO. 30

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 31



N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

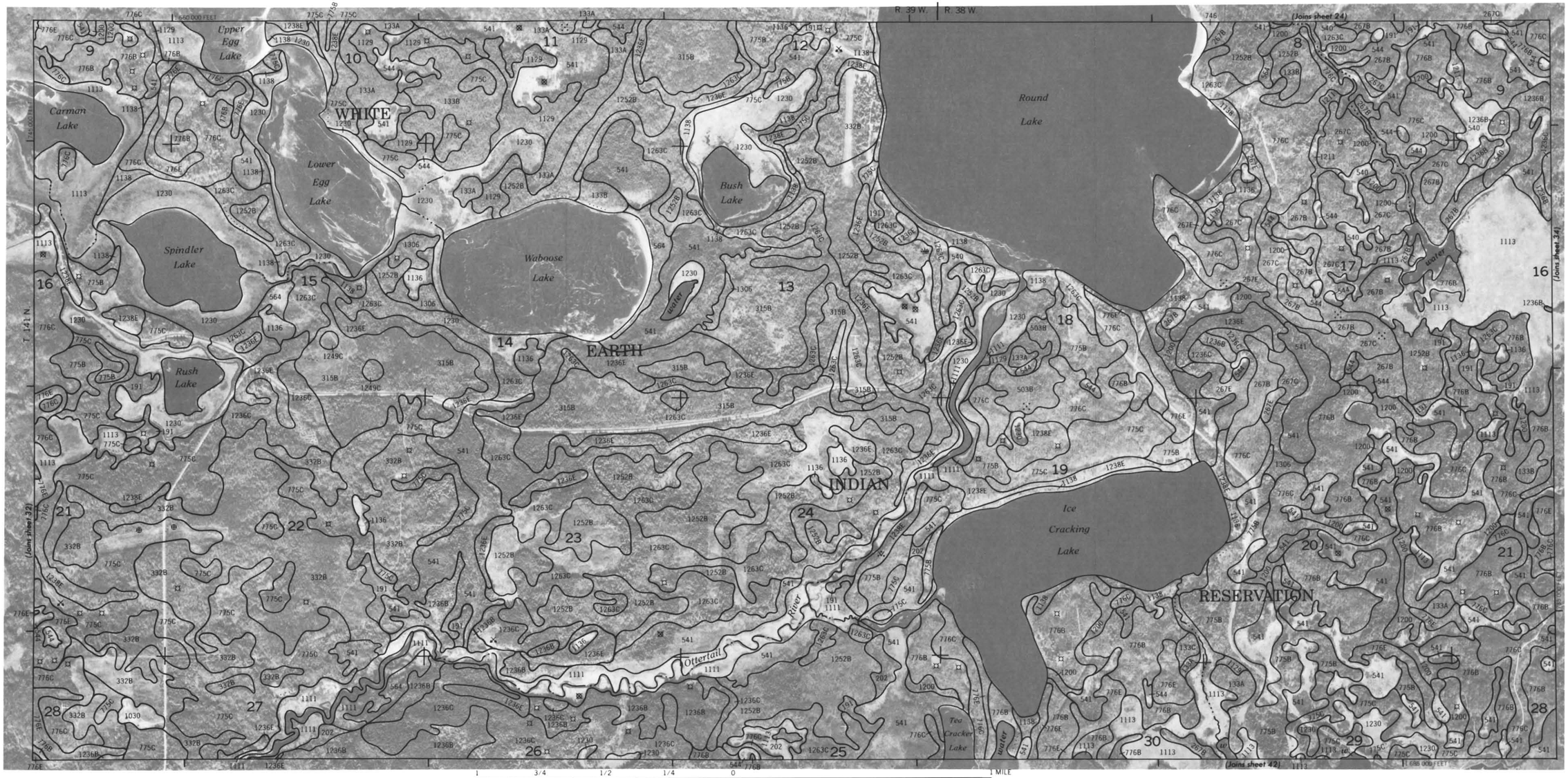
BECKER COUNTY MINNESOTA NO. 32

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 33



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

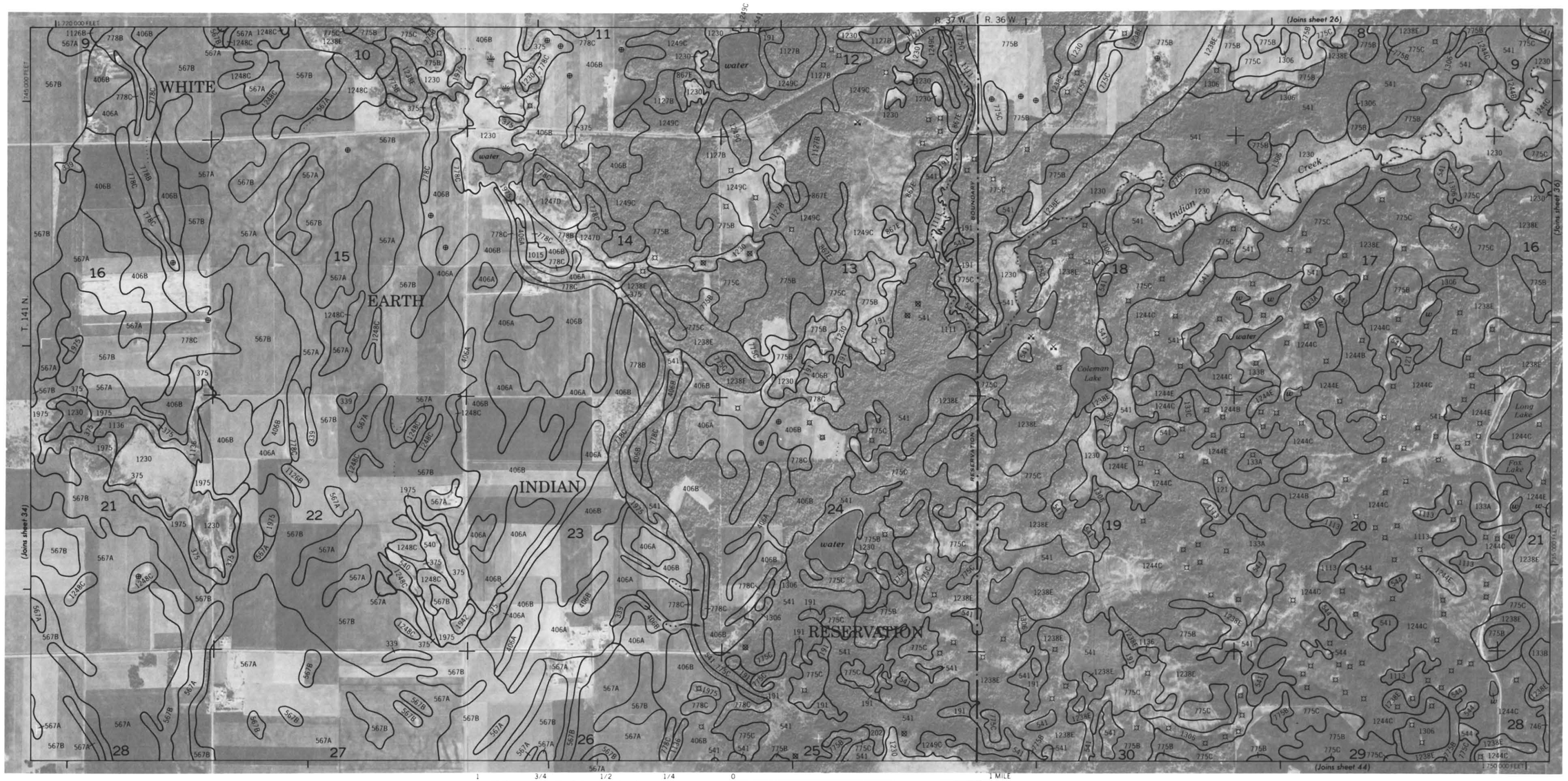
BECKER COUNTY MINNESOTA NO. 34

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

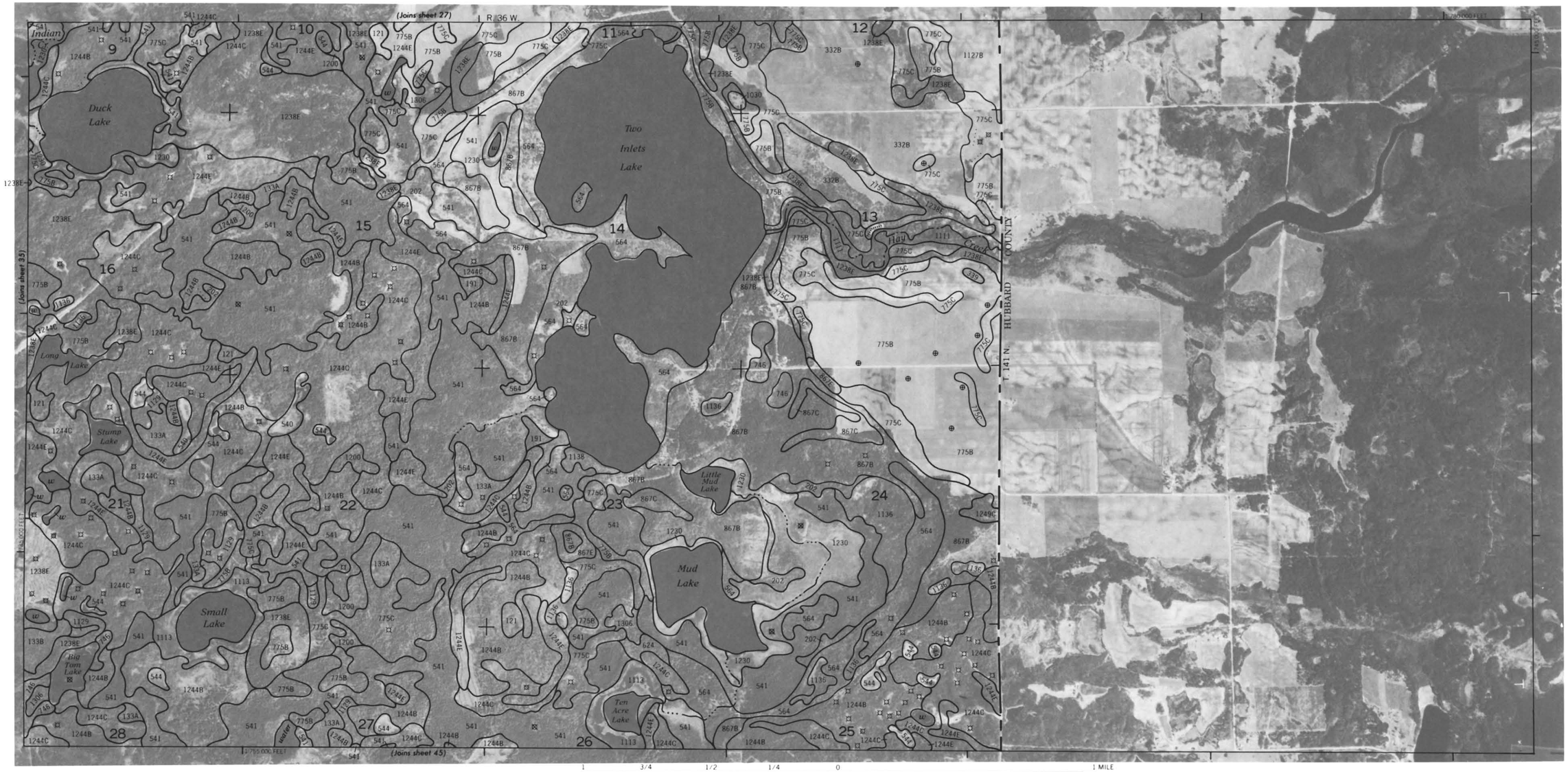
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 35



N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

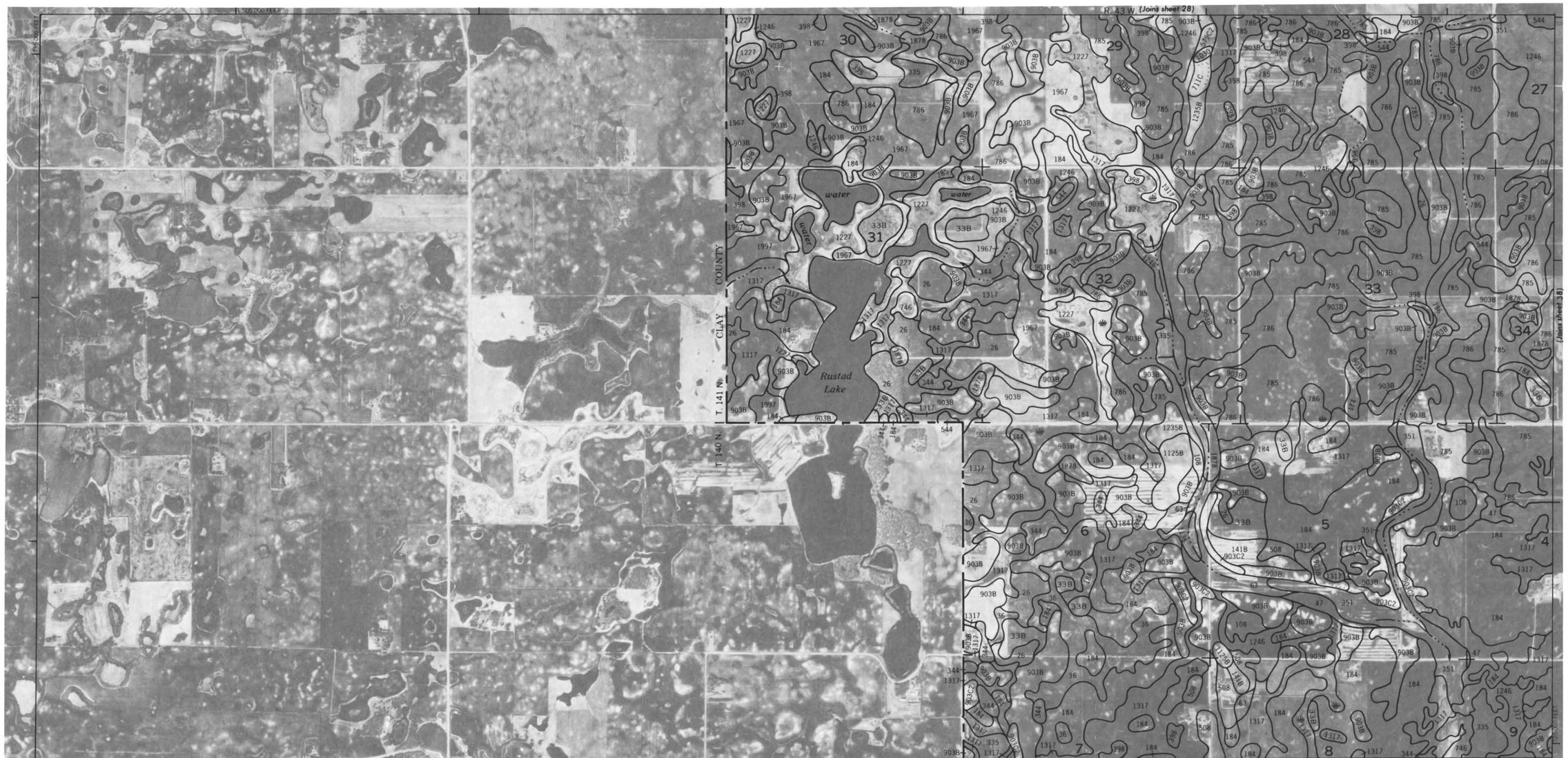
BECKER COUNTY MINNESOTA NO. 36

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 37



N

1 MILE

1 KILOMETER

SCALE 1:20 000

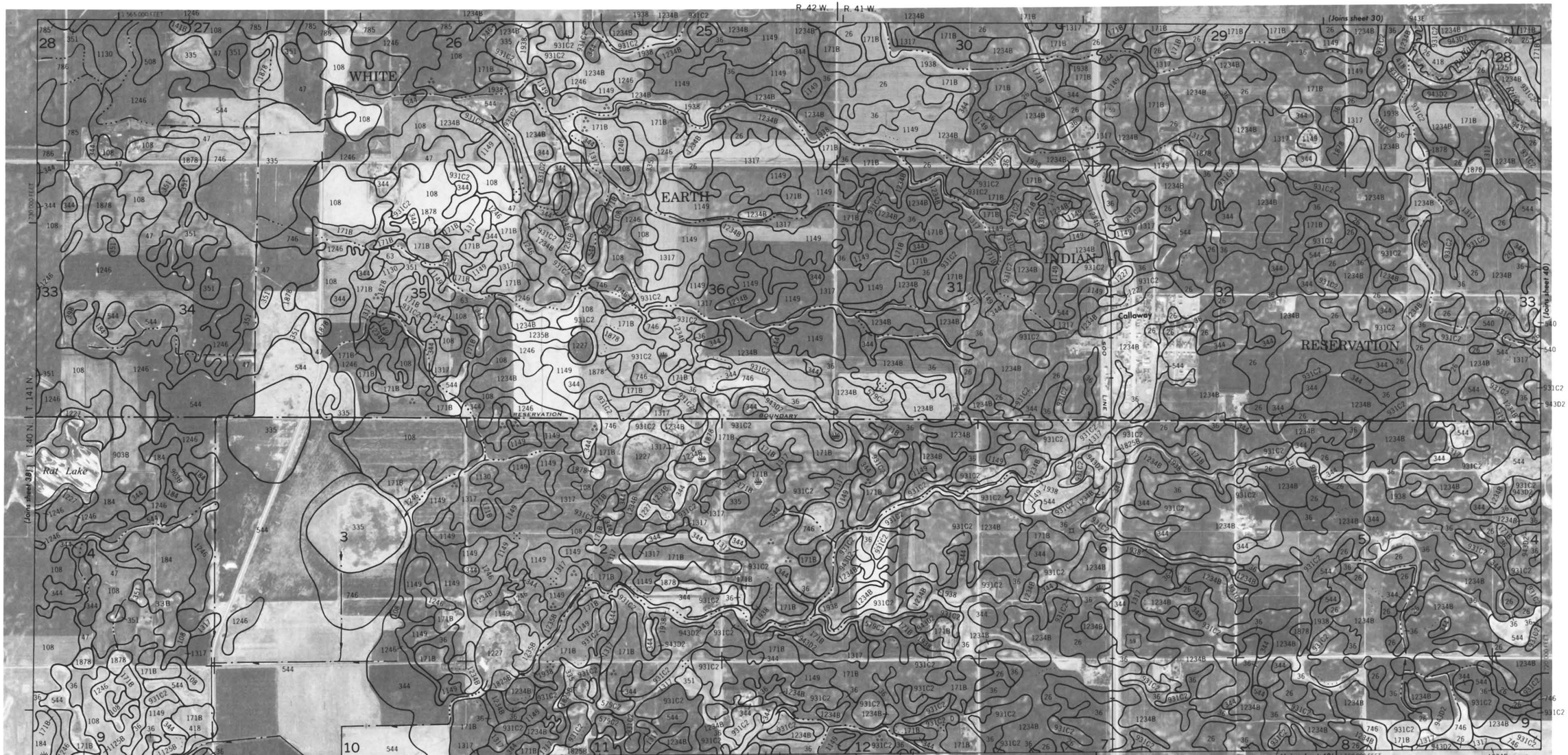
BECKER COUNTY MINNESOTA NO. 38

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

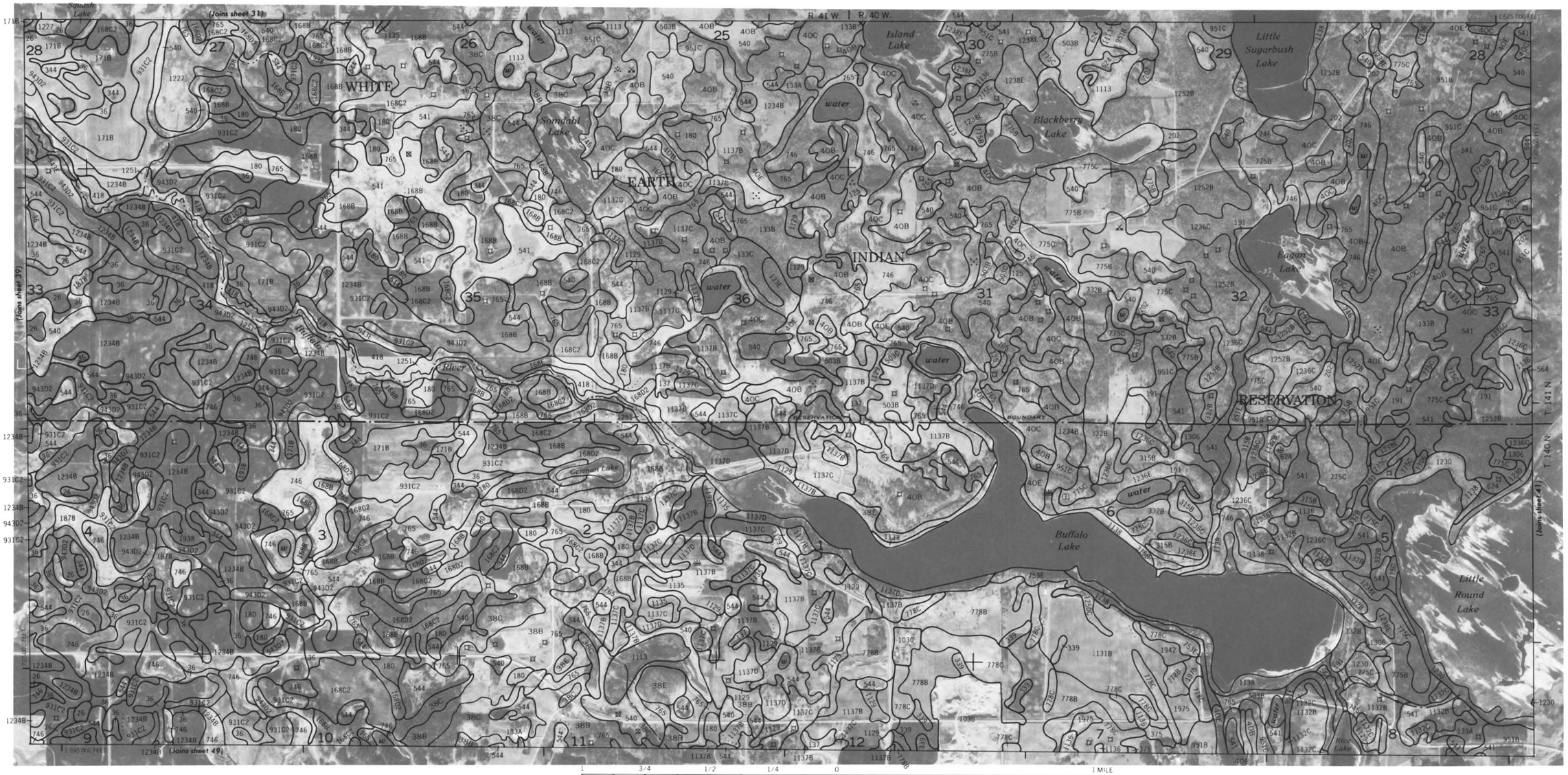
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 39



N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

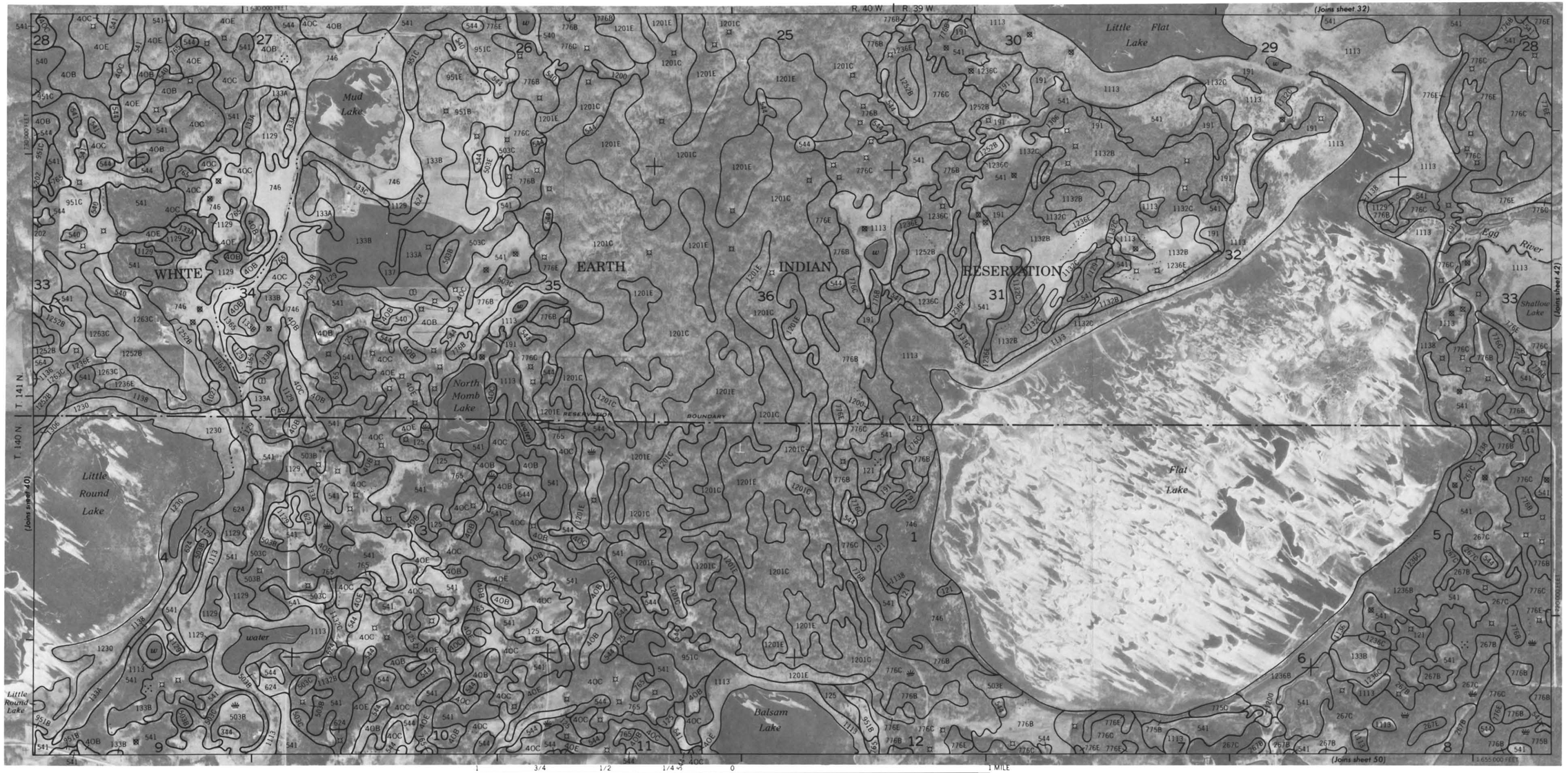
BECKER COUNTY, MINNESOTA NO. 40

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

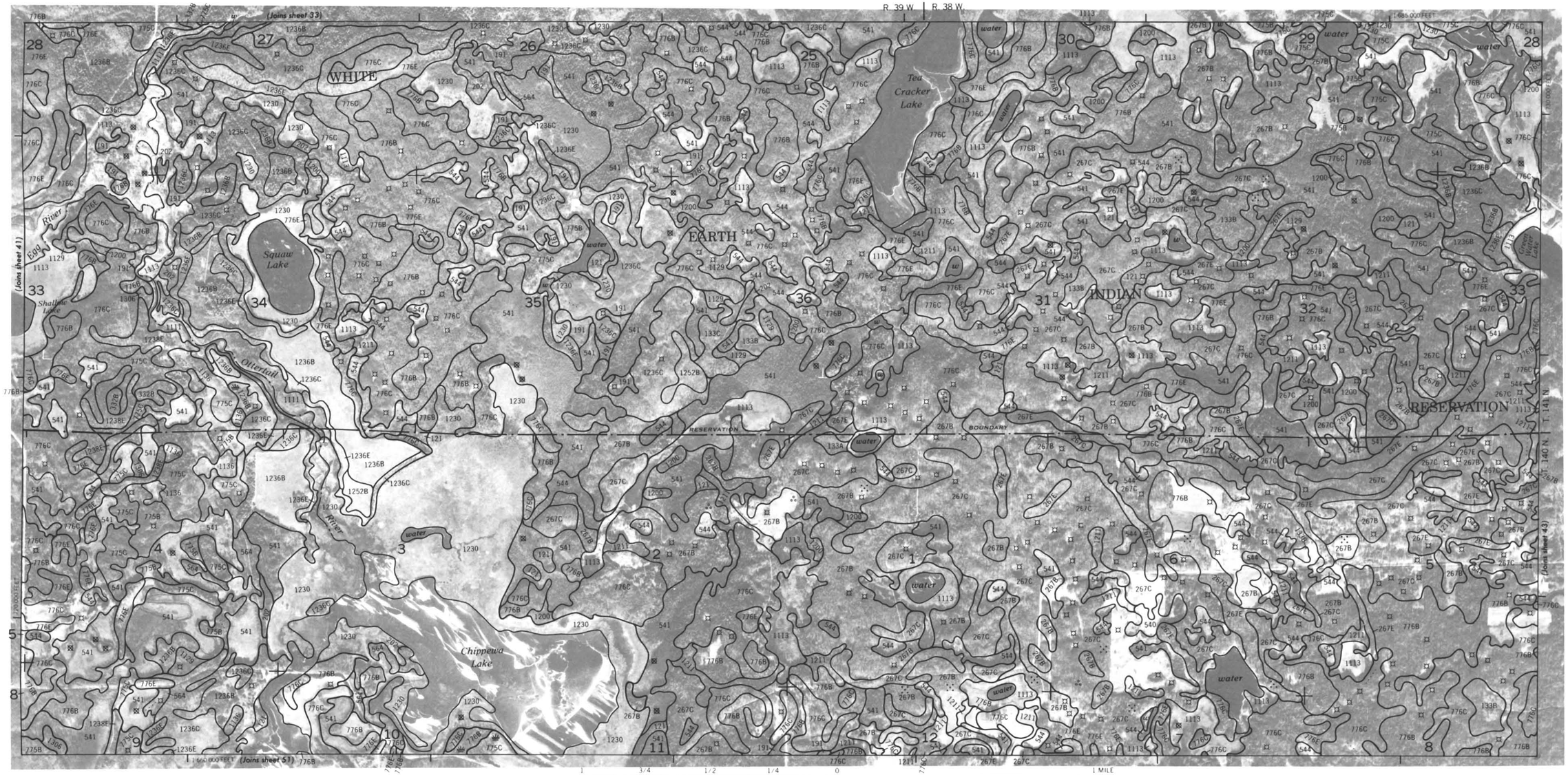
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 41



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 42



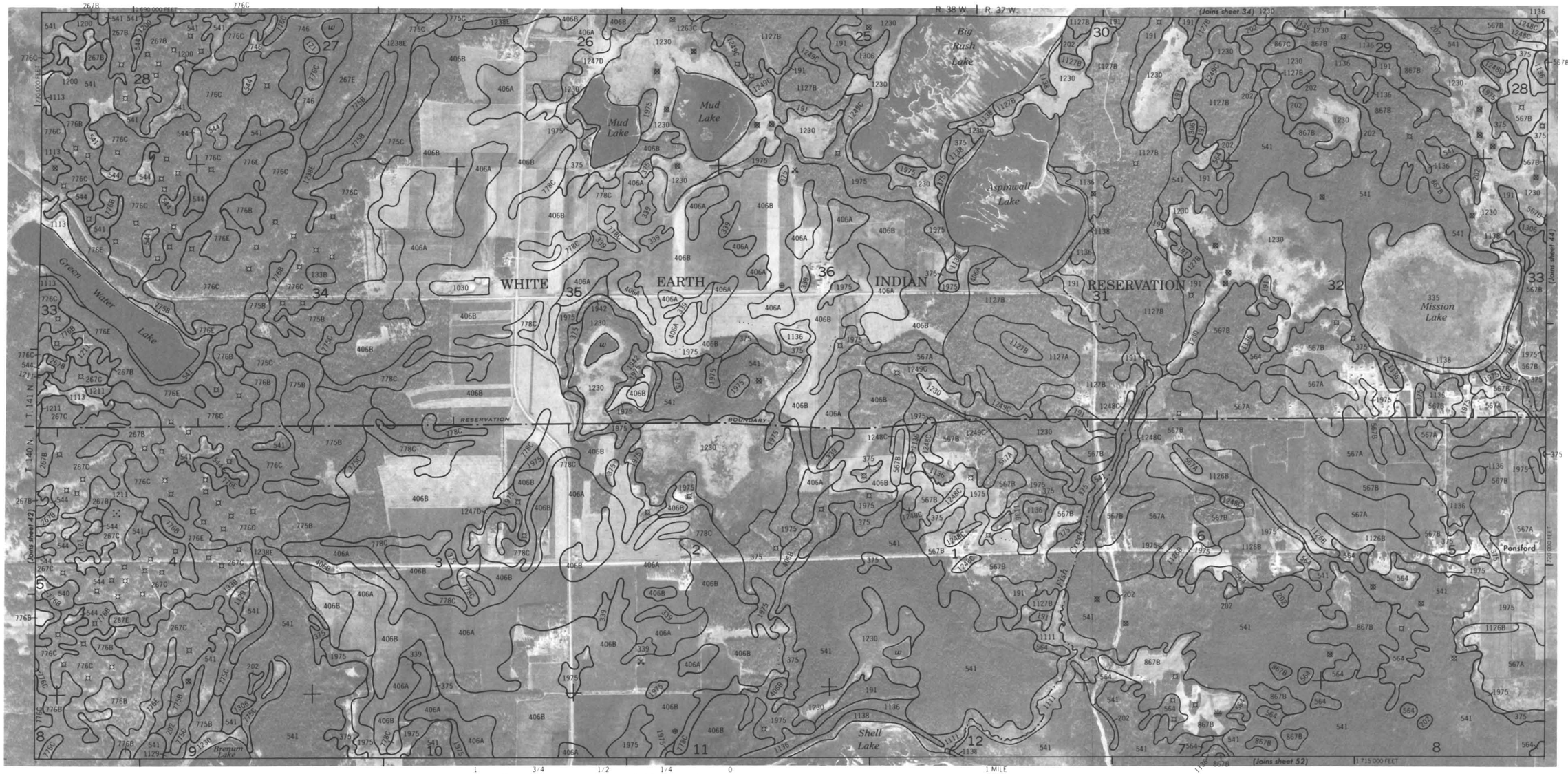
BECKER COUNTY MINNESOTA NO. 42

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 43



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

44

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

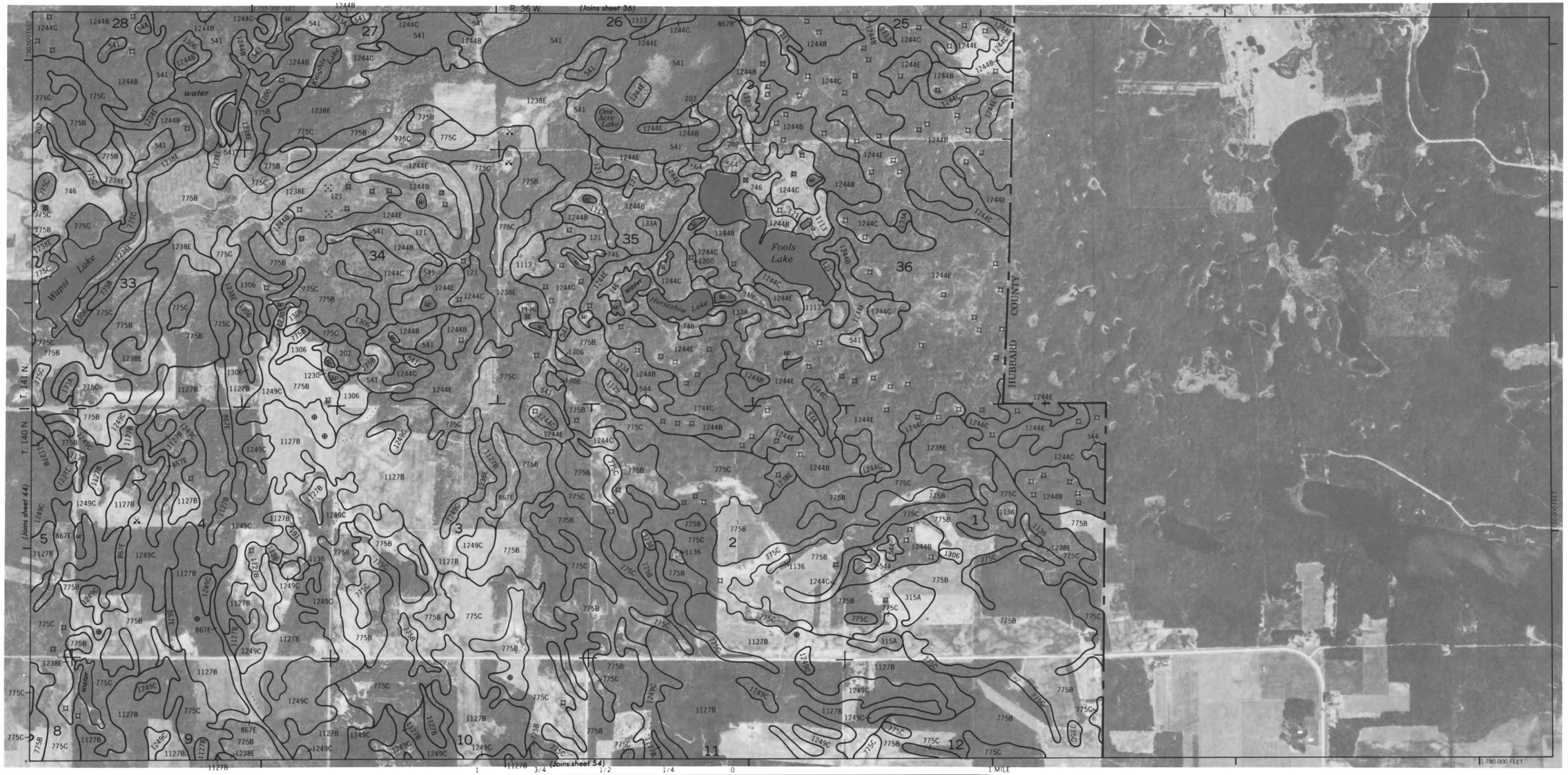
BECKER COUNTY MINNESOTA NO. 44

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 45



46

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

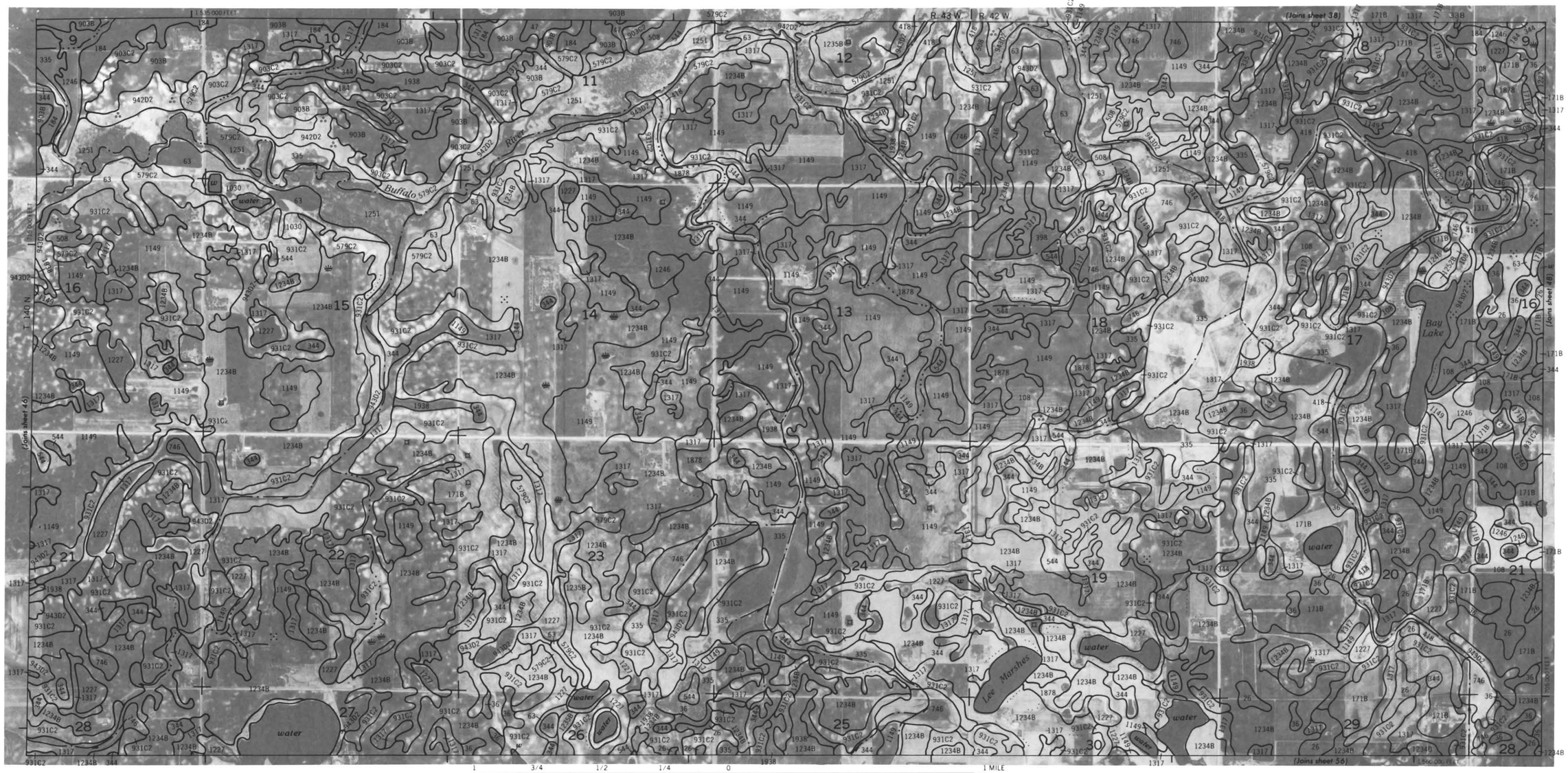
BECKER COUNTY MINNESOTA NO. 46

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 47



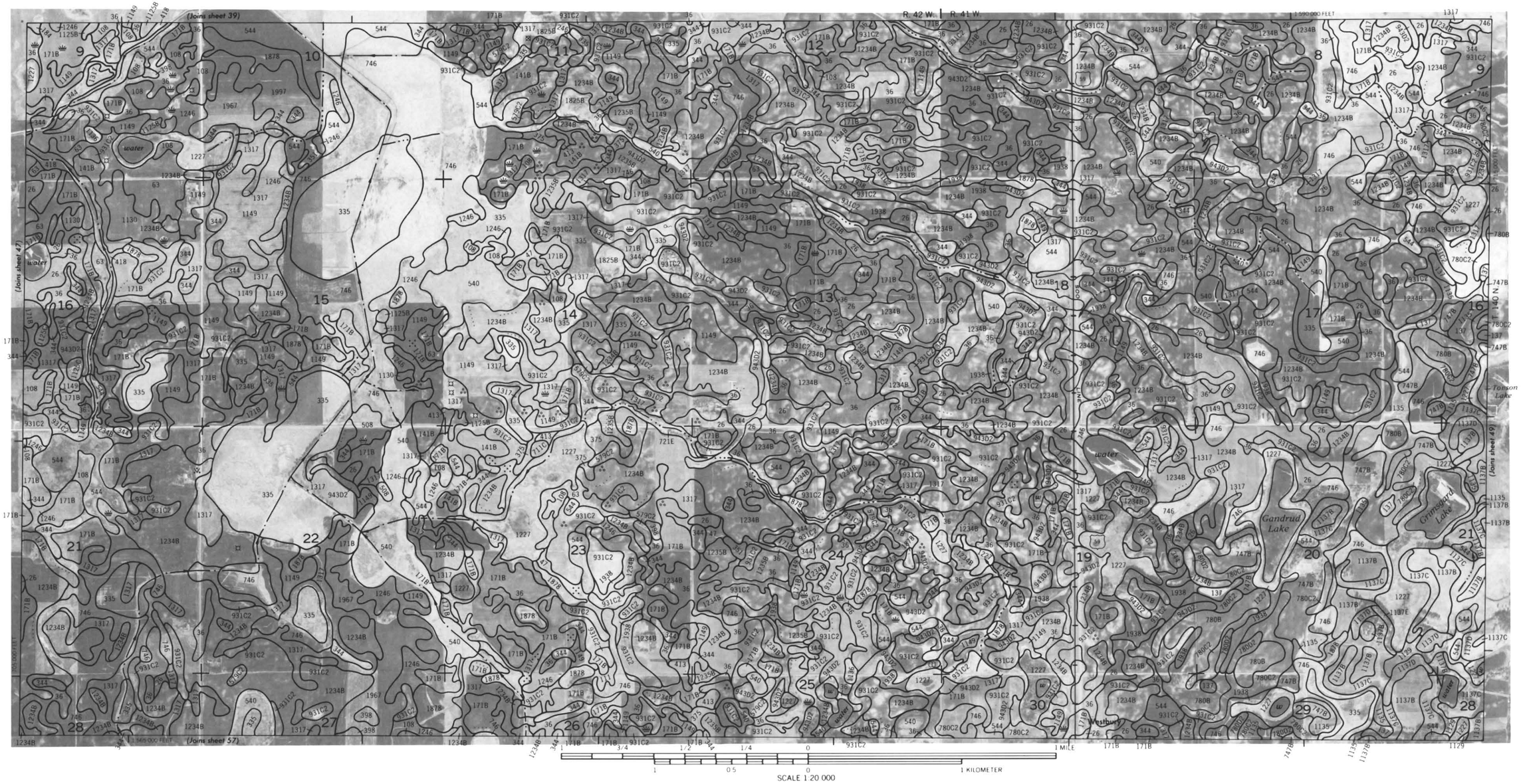
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 48

N



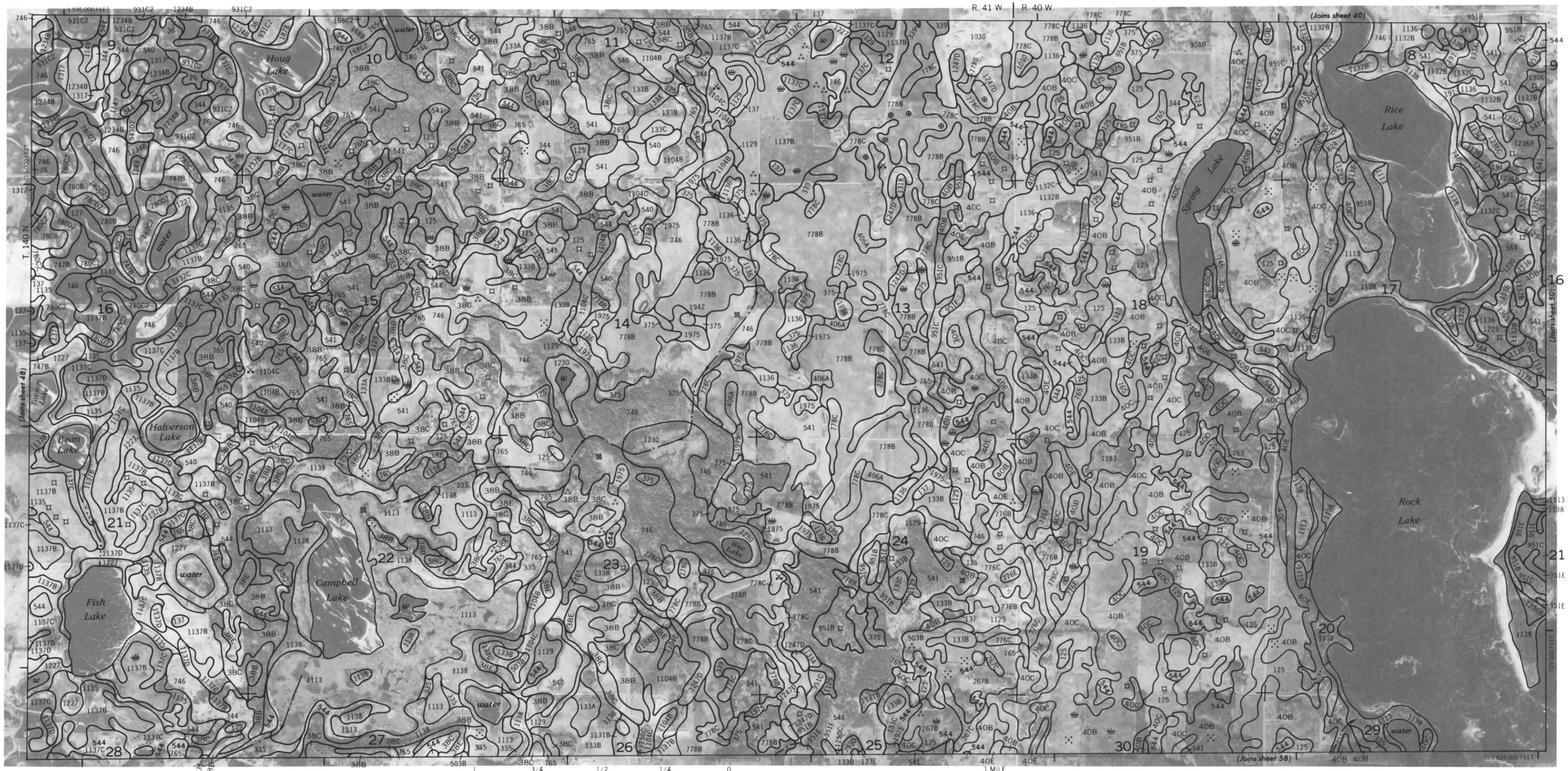
BECKER COUNTY MINNESOTA NO. 48

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

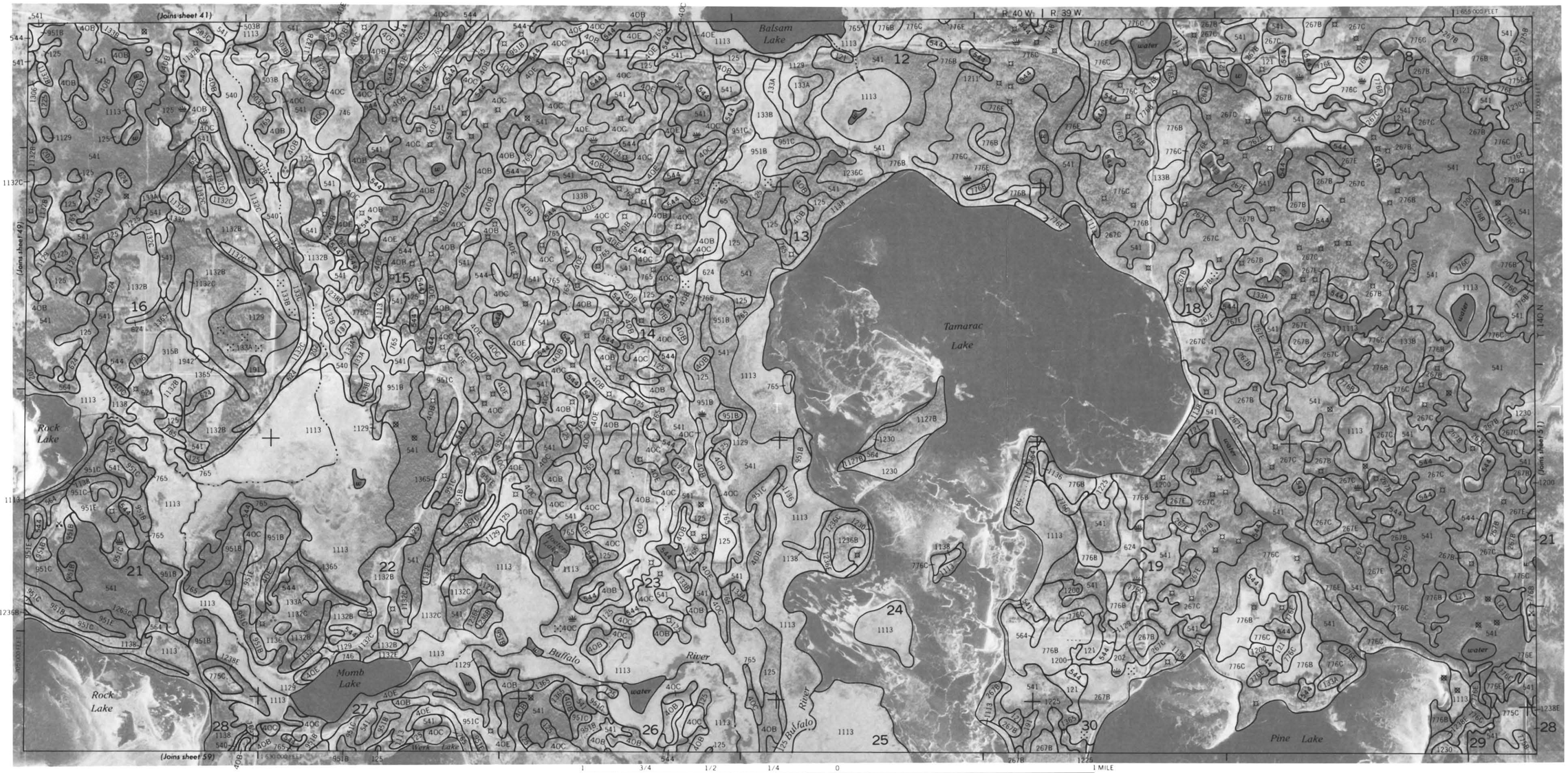
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 49



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 50



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

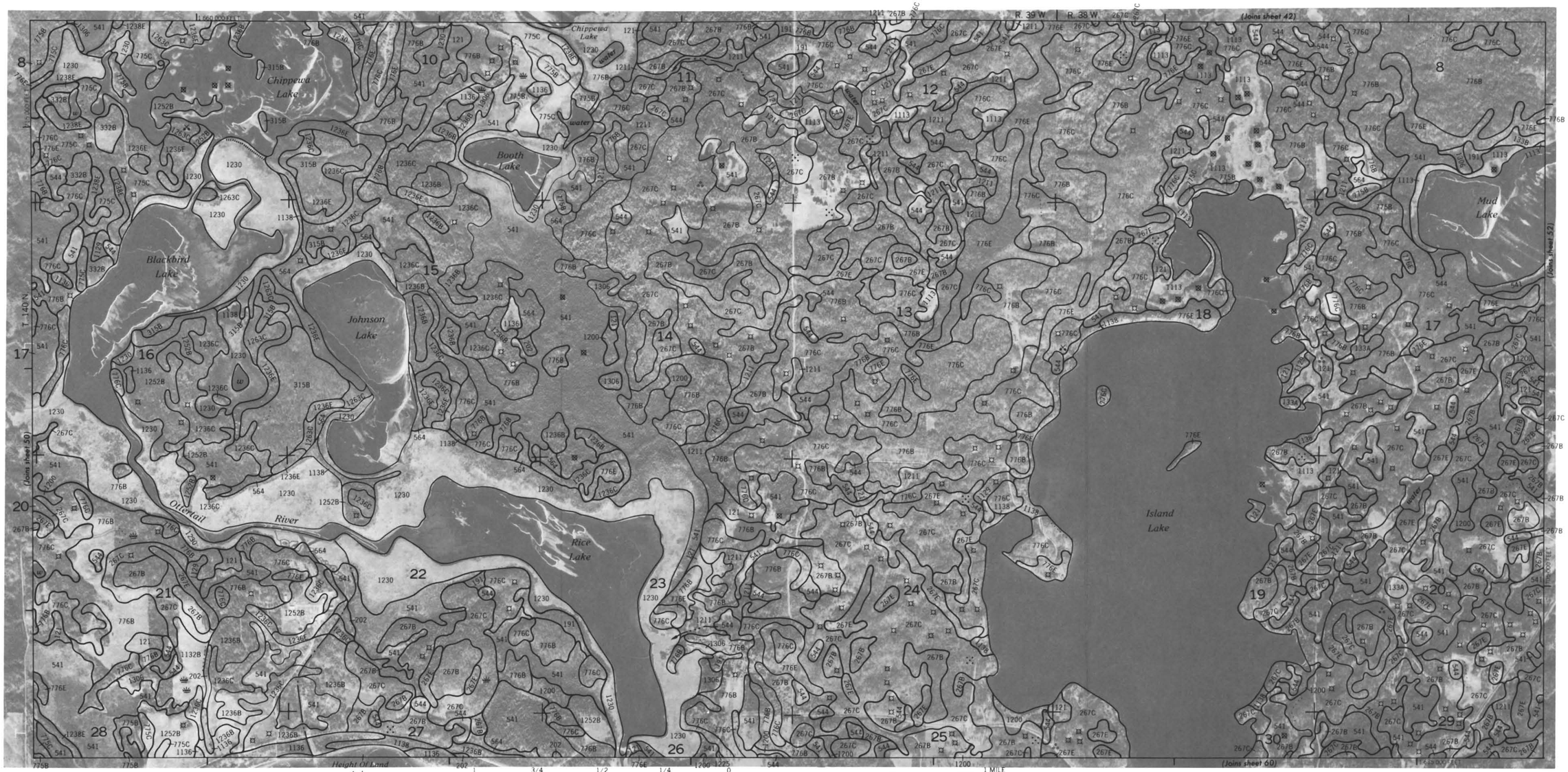
BECKER COUNTY MINNESOTA NO. 50

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 51



52

N

1 3/4 1/2 1/4 0 1 MILE

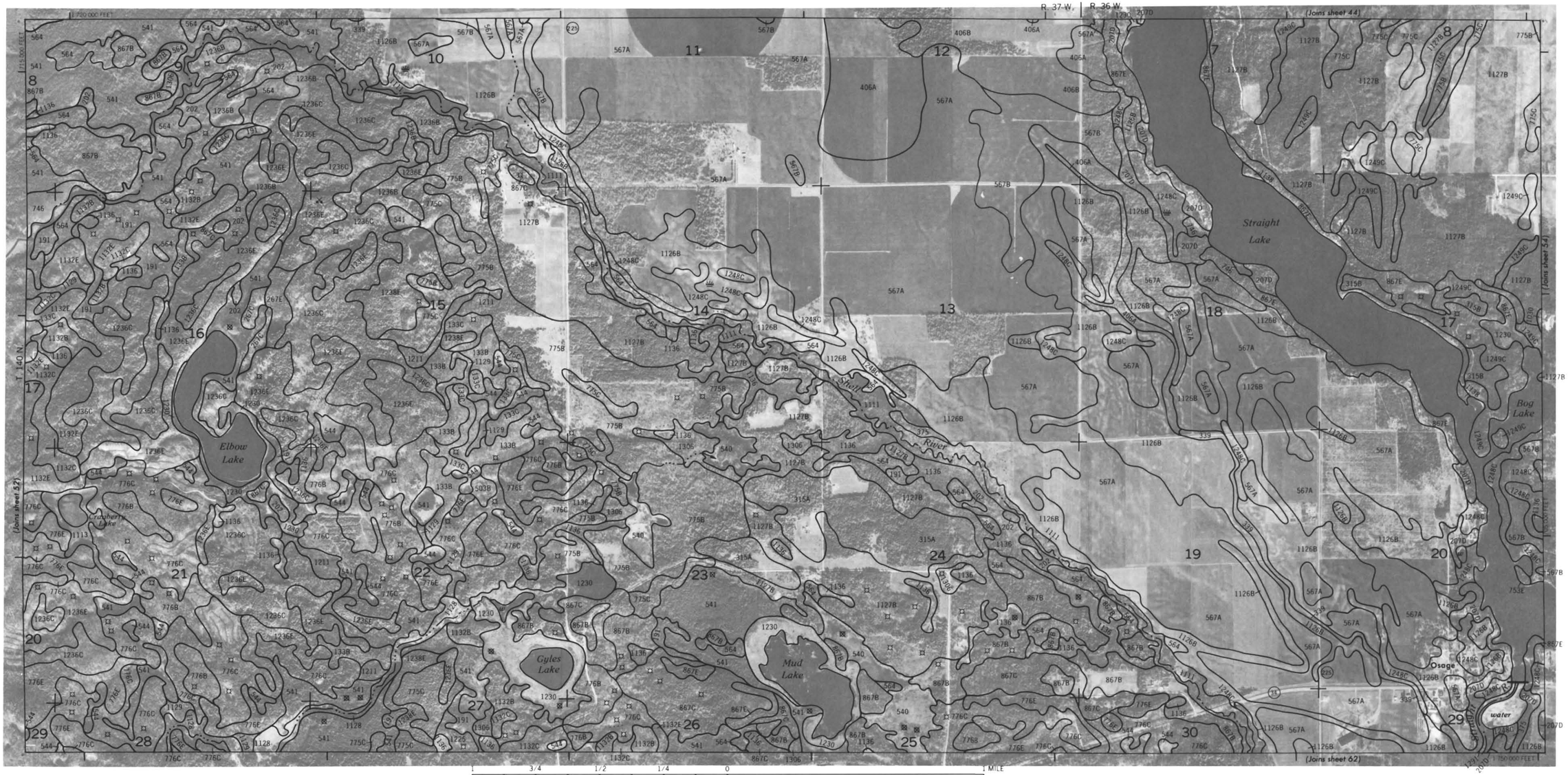
1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 52

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



BECKER COUNTY MINNESOTA NO. 53

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

54

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

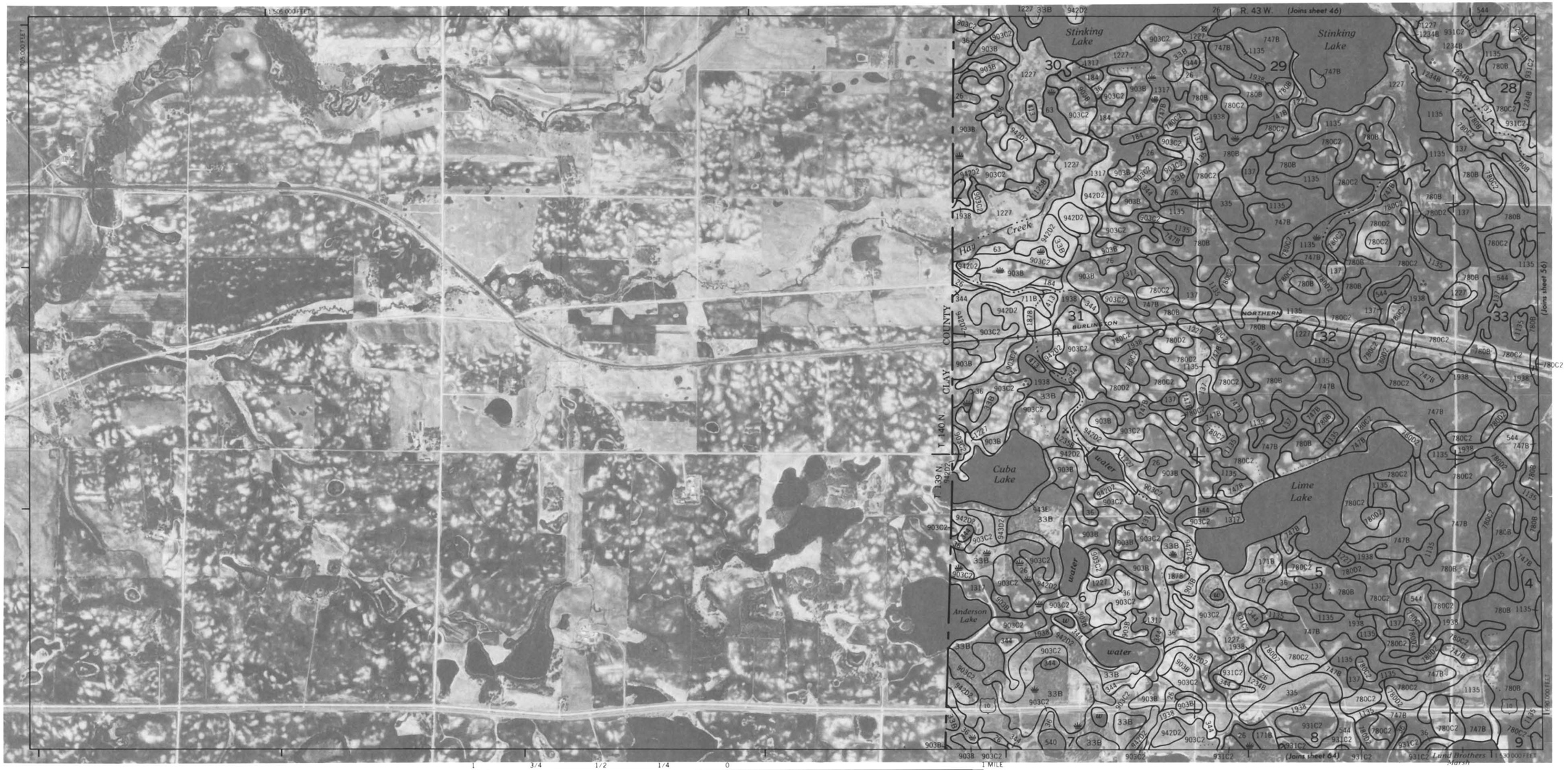
BECKER COUNTY MINNESOTA NO. 54

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 55



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 56

N

1 3/4 1/2 1/4 0 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

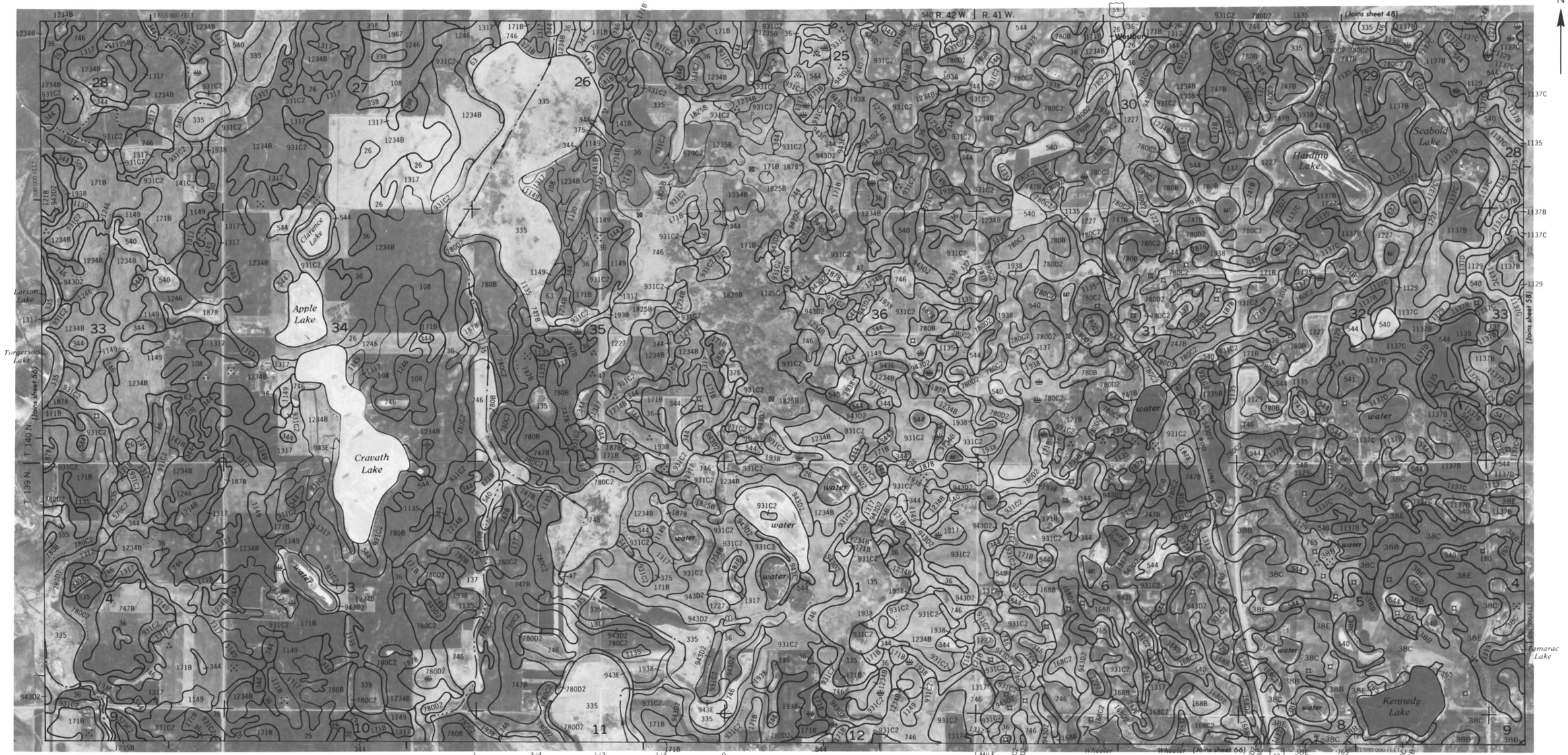
BECKER COUNTY MINNESOTA NO. 56

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 57



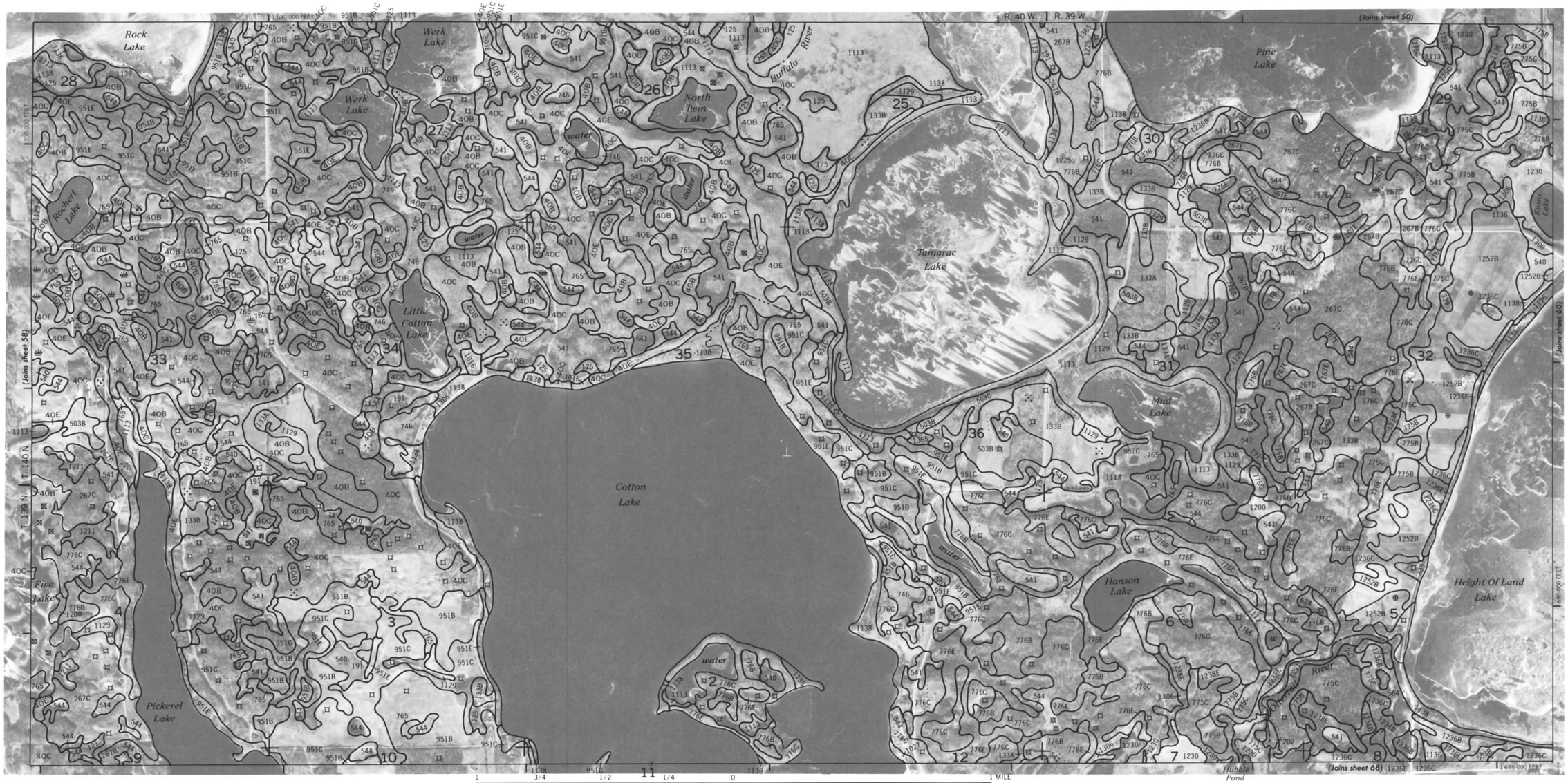
BECKER COUNTY MINNESOTA NO. 58

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

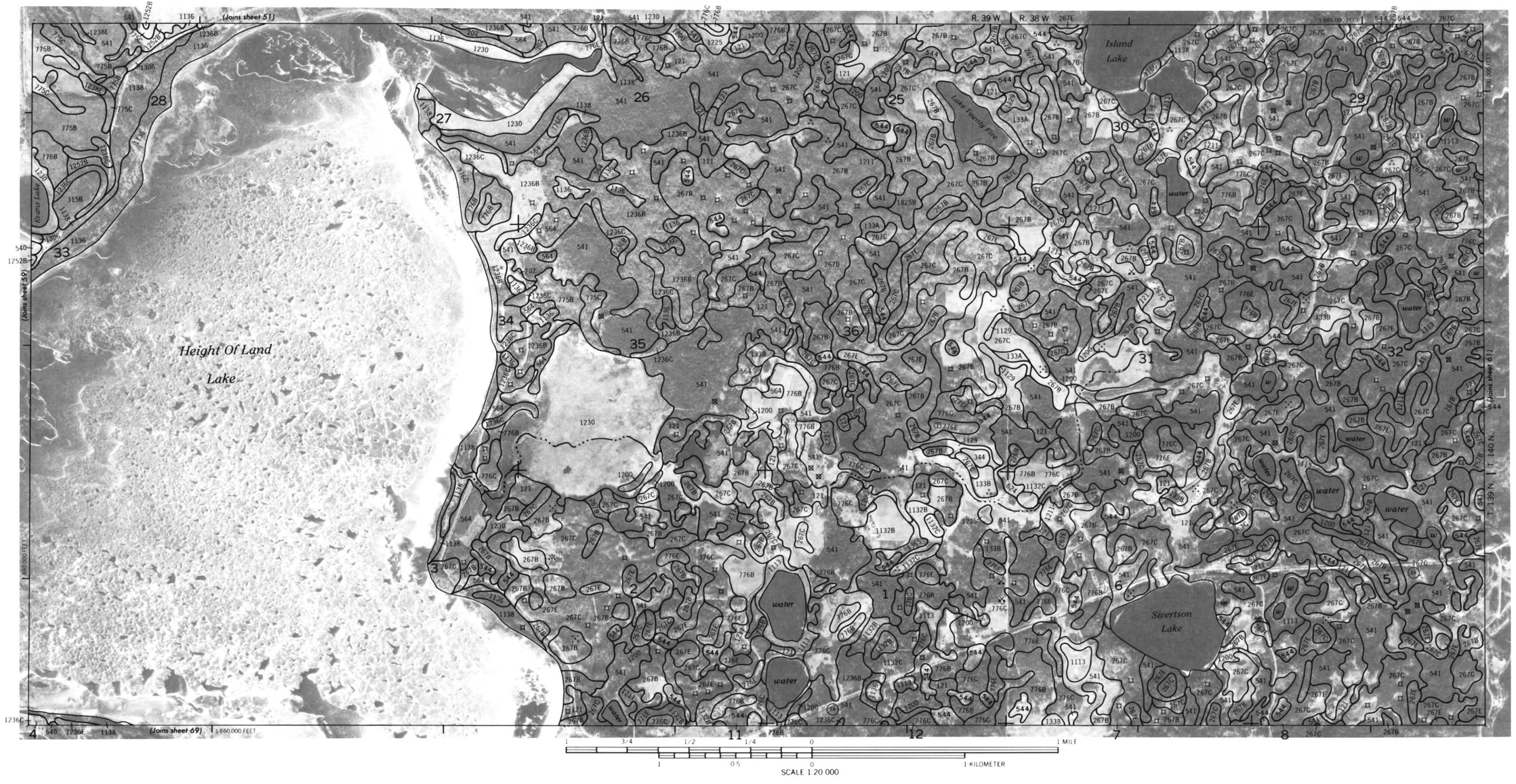
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 59



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 60



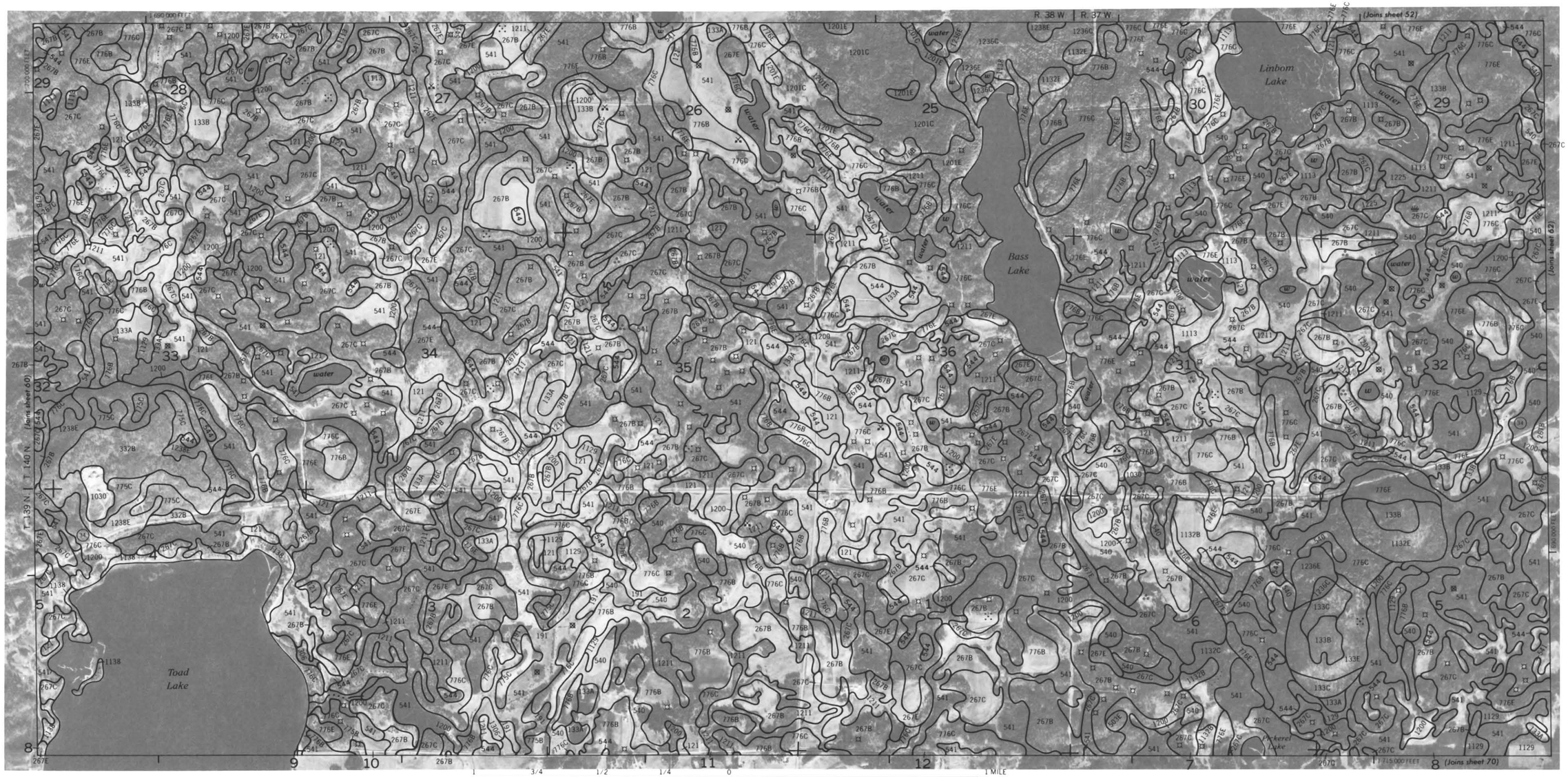
BECKER COUNTY MINNESOTA NO. 60

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

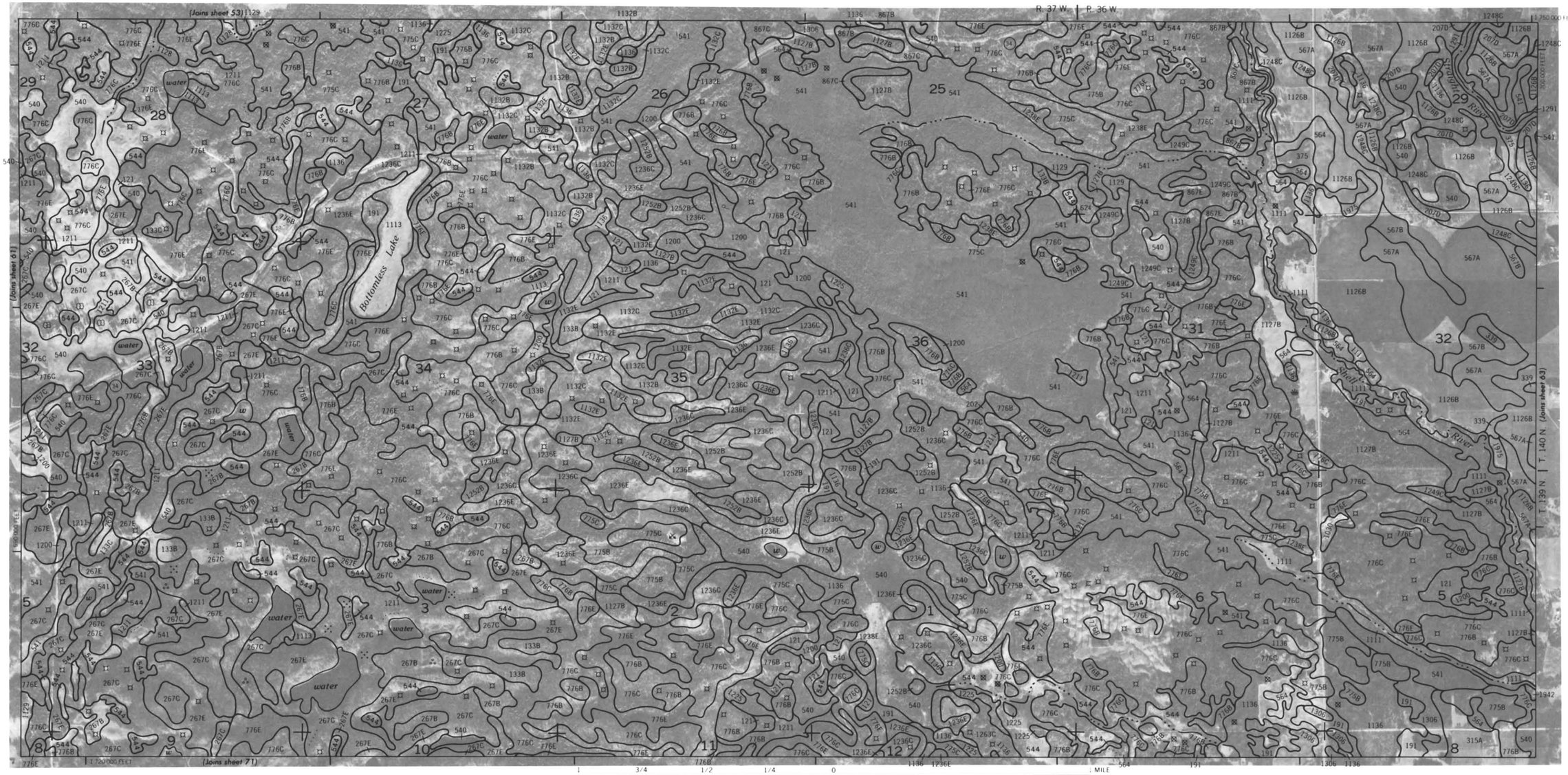
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 61



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 62

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

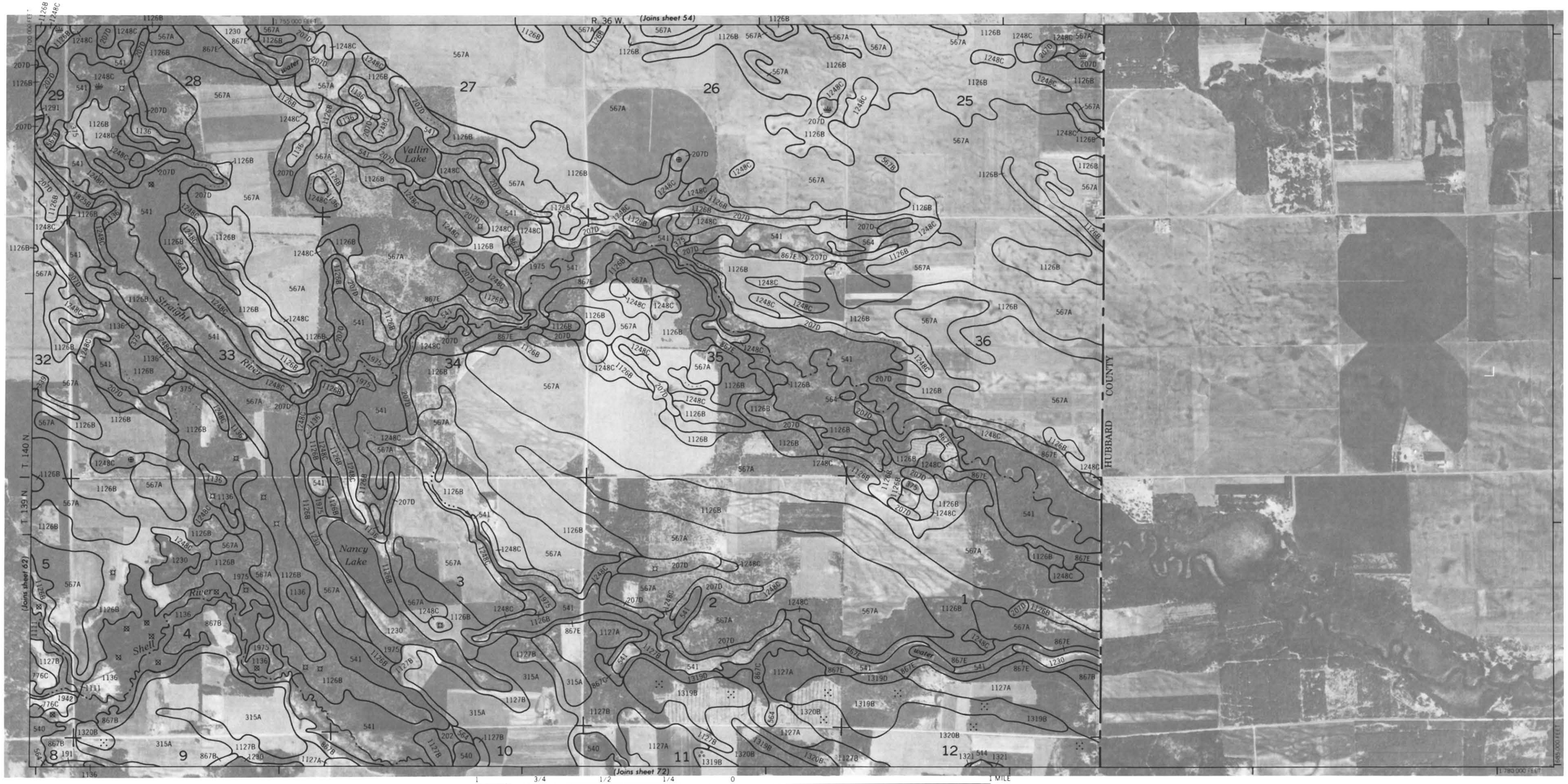
BECKER COUNTY MINNESOTA NO. 62

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

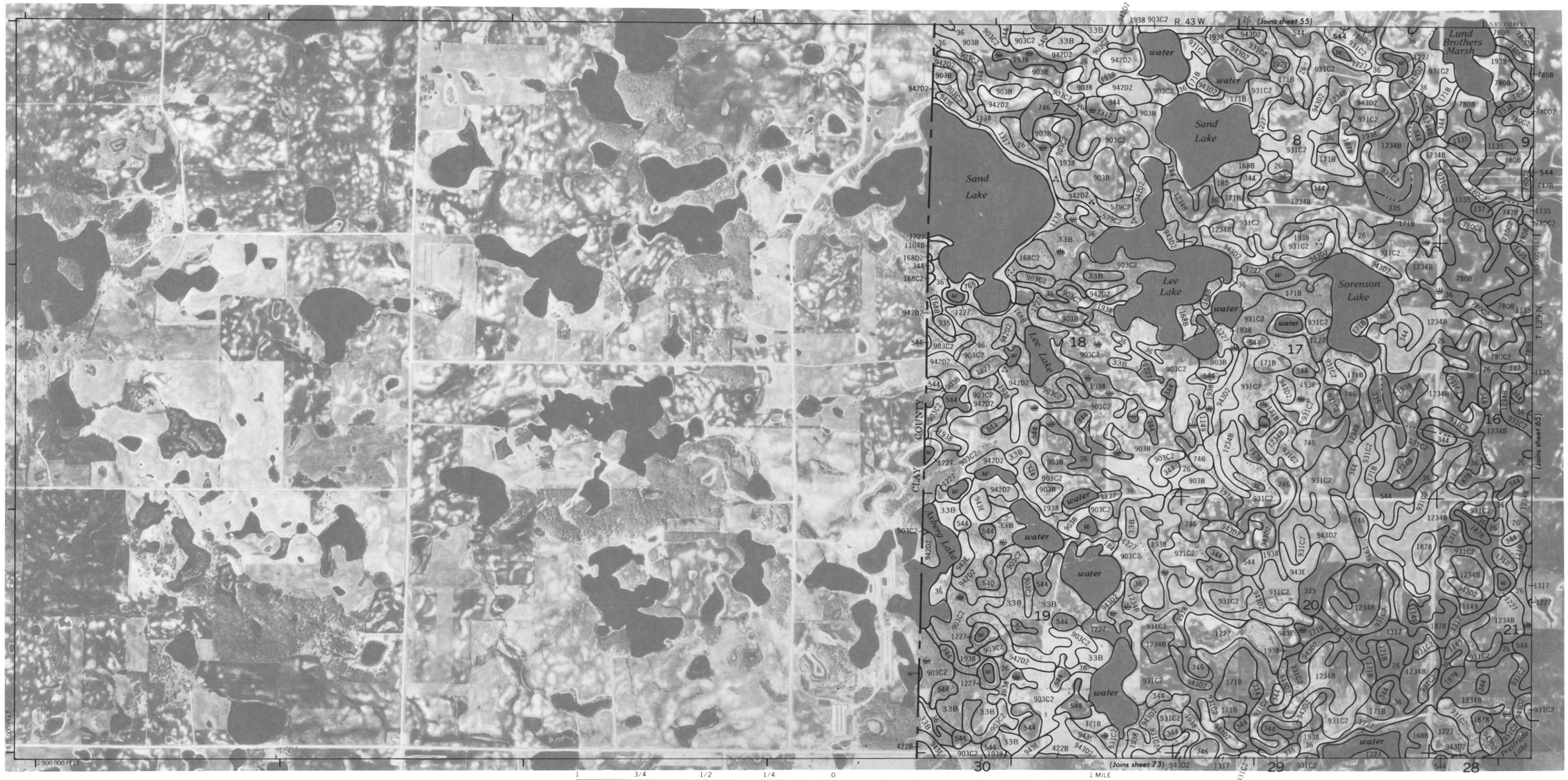
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 63



N

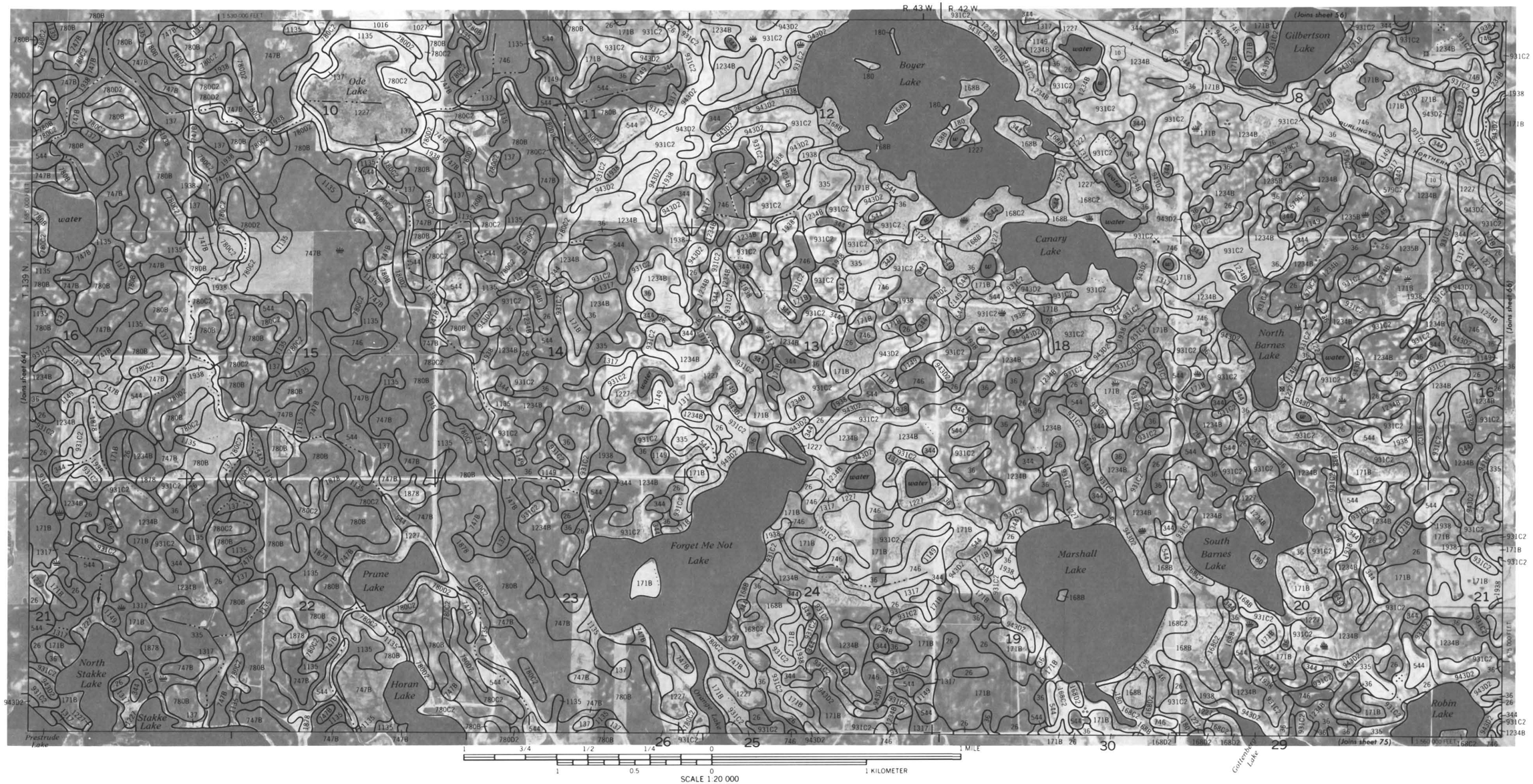


BECKER COUNTY MINNESOTA NO. 64

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 65



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 66

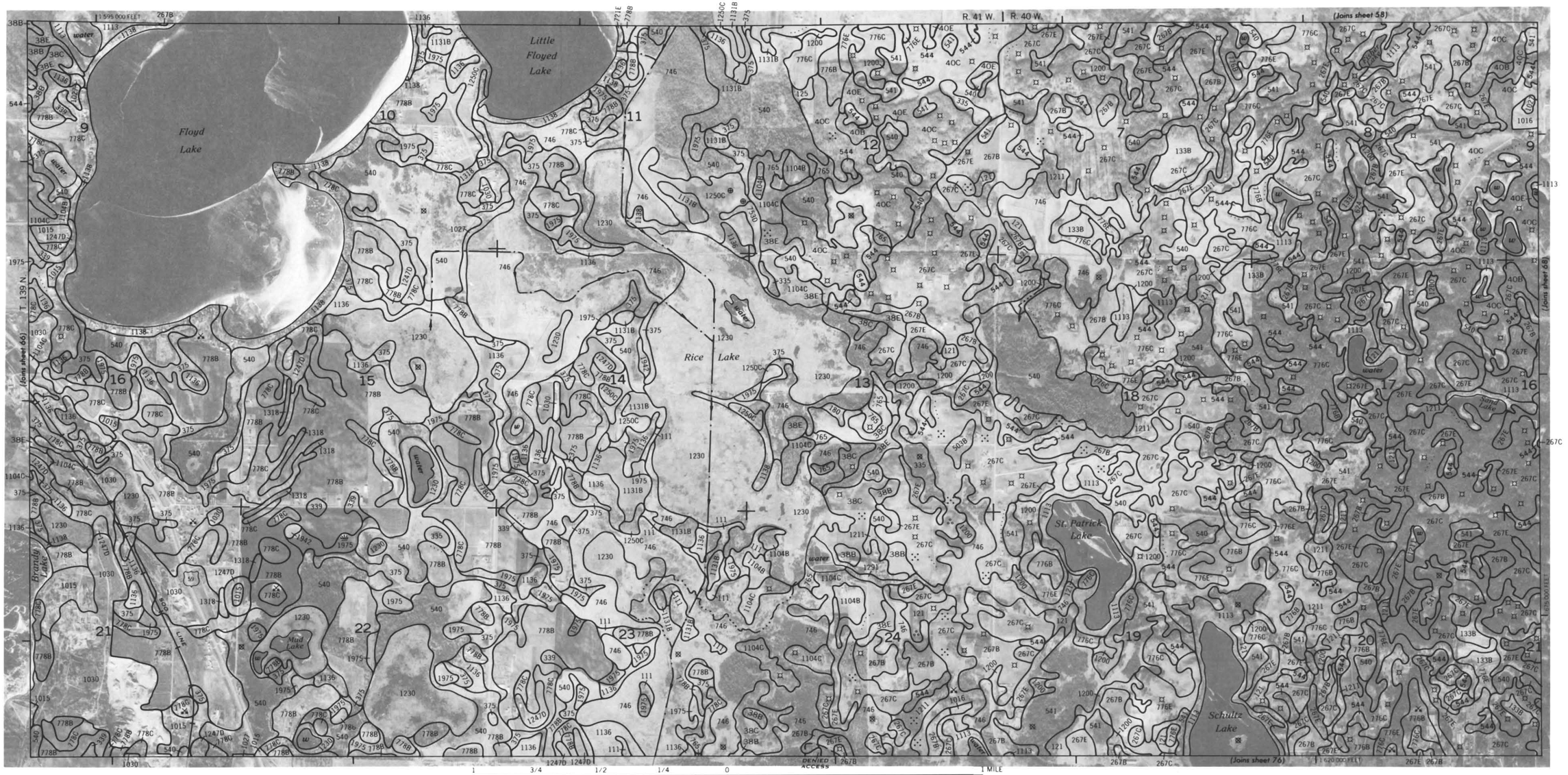
BECKER COUNTY MINNESOTA NO. 66

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

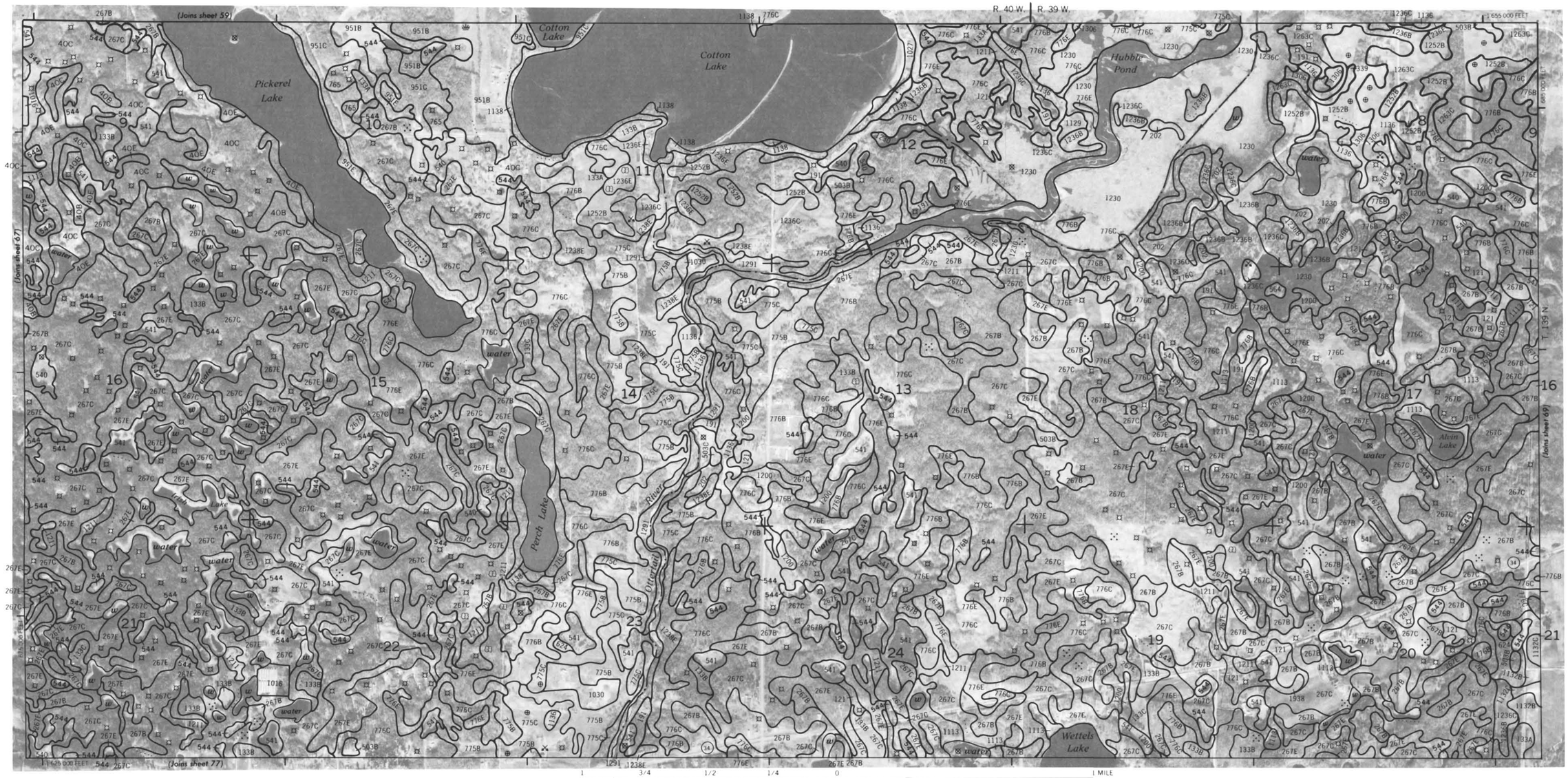
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 67



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 68

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 68

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

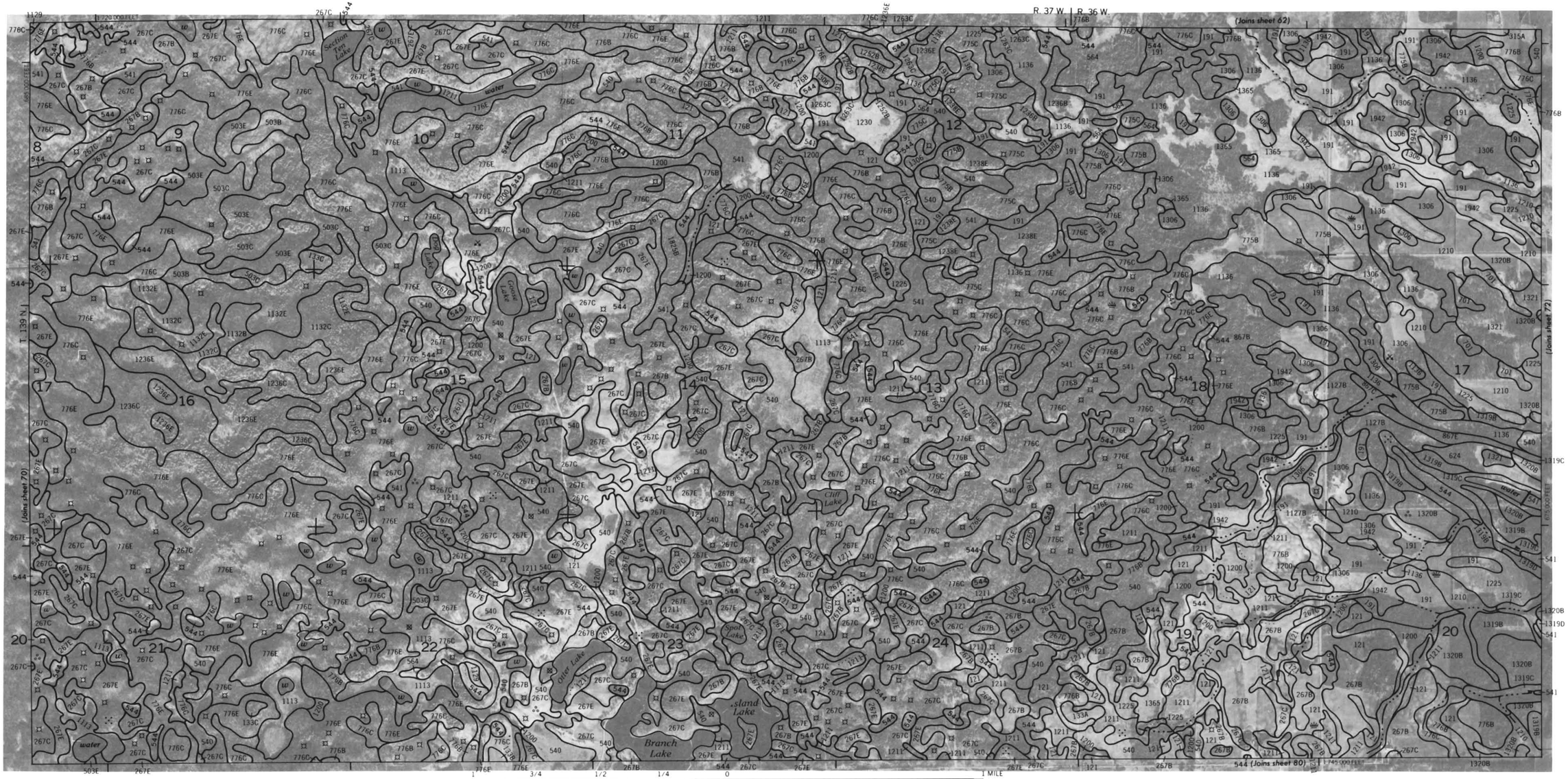
BECKER COUNTY MINNESOTA NO. 69

BECKER COUNTY MINNESOTA NO. 70

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

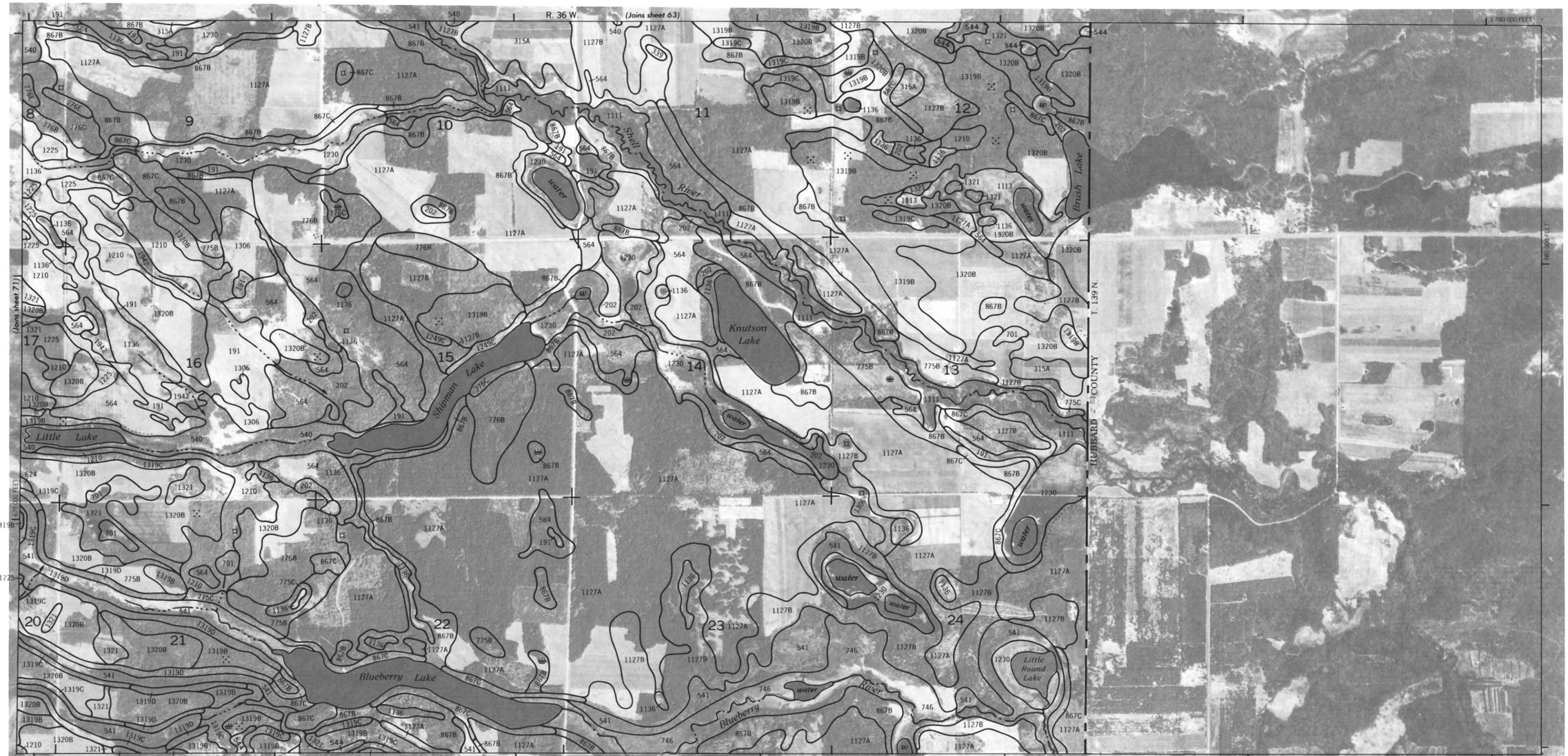
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 71



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 72

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 72

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 73

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 74

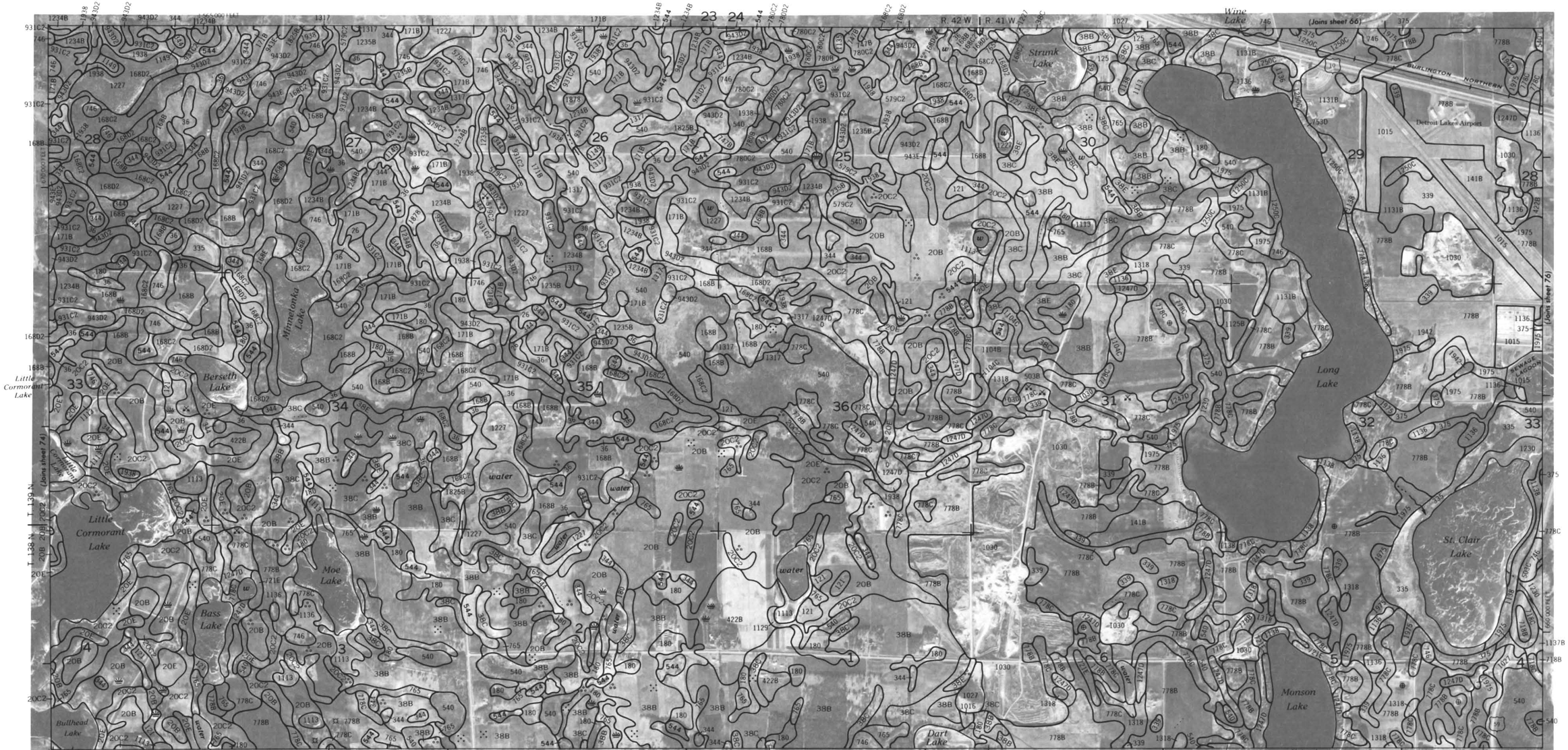
BECKER COUNTY MINNESOTA NO. 74

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

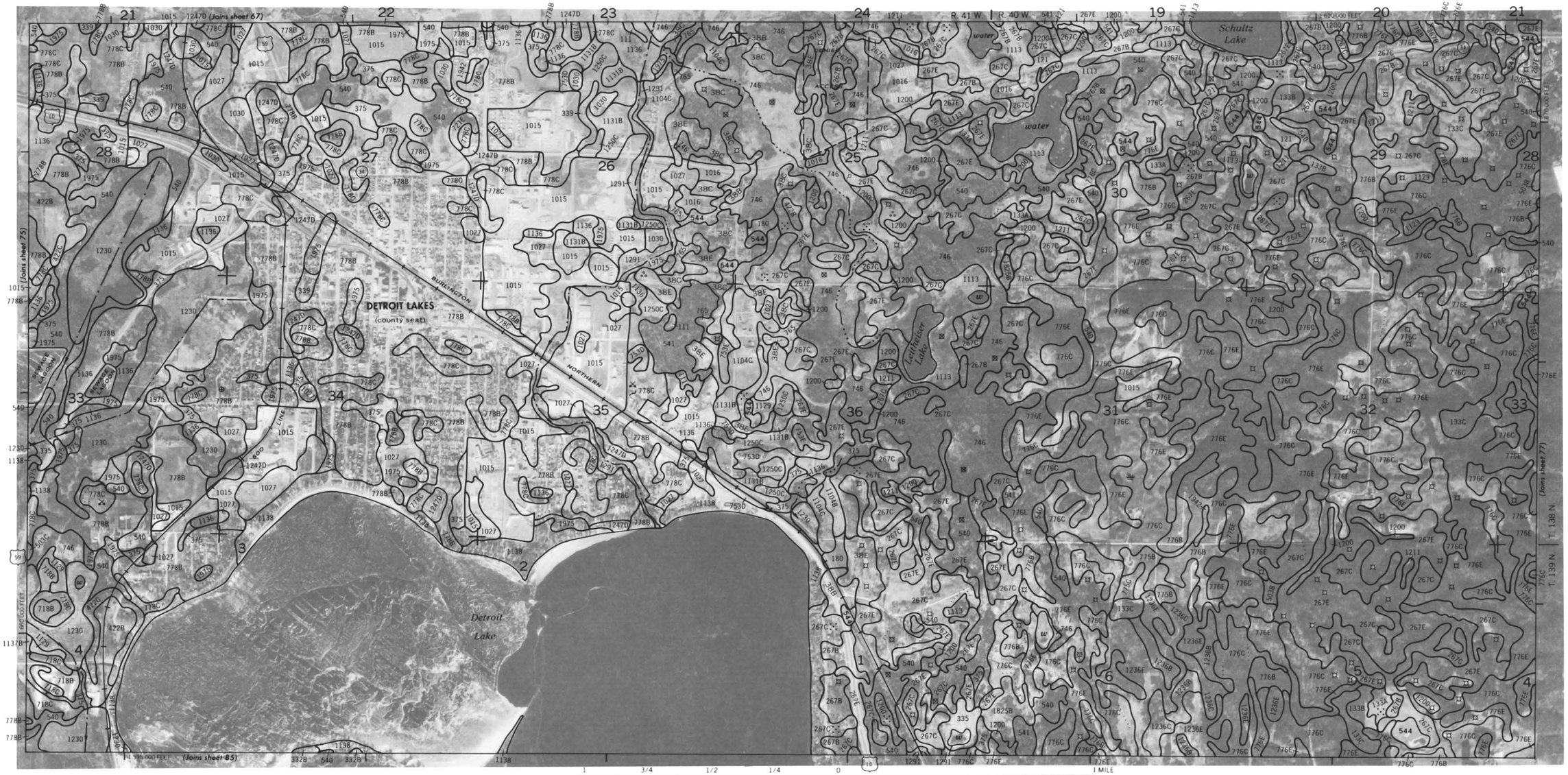
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 75



N

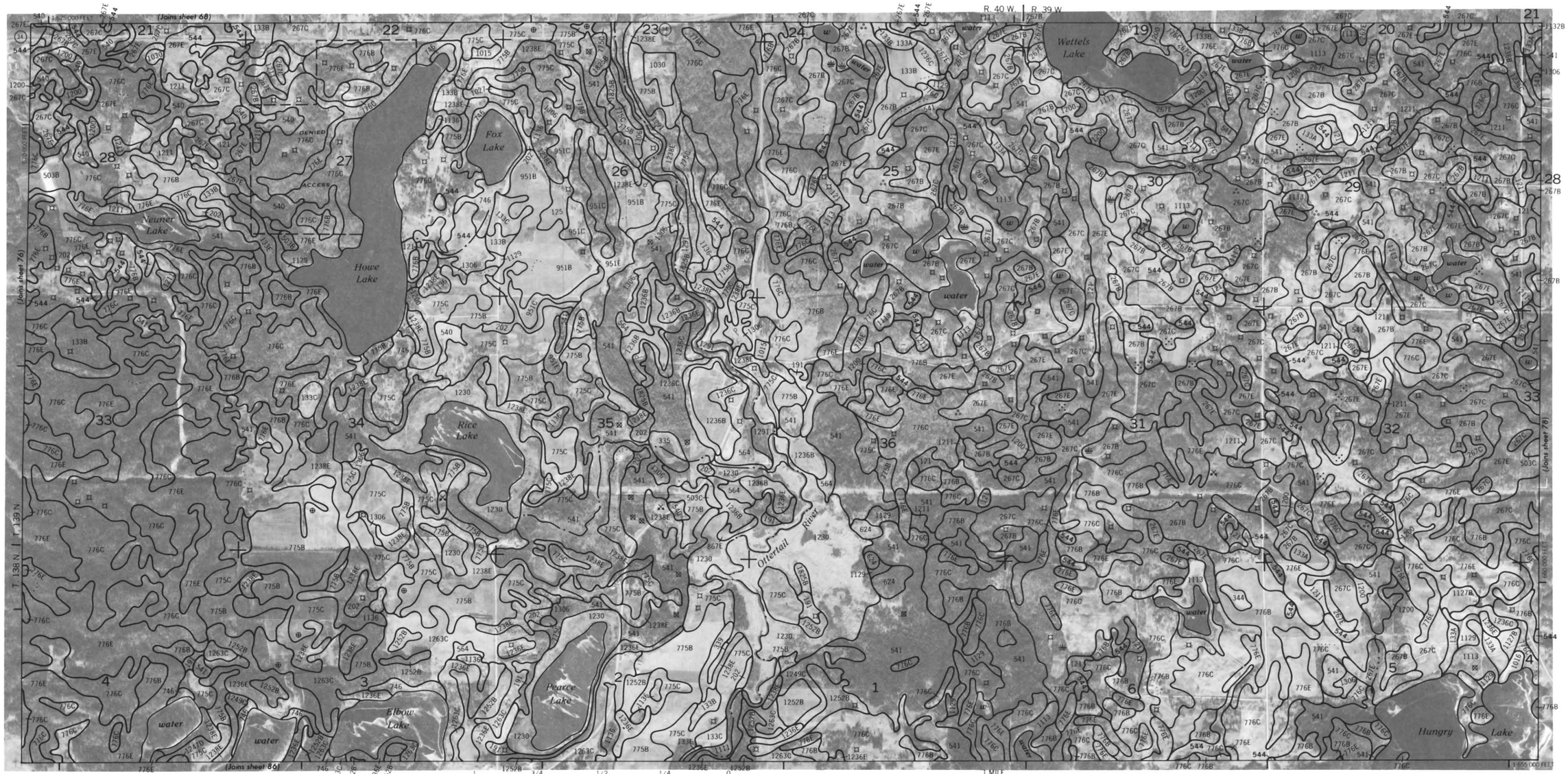


BECKER COUNTY MINNESOTA NO. 76

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 77



78

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 78

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

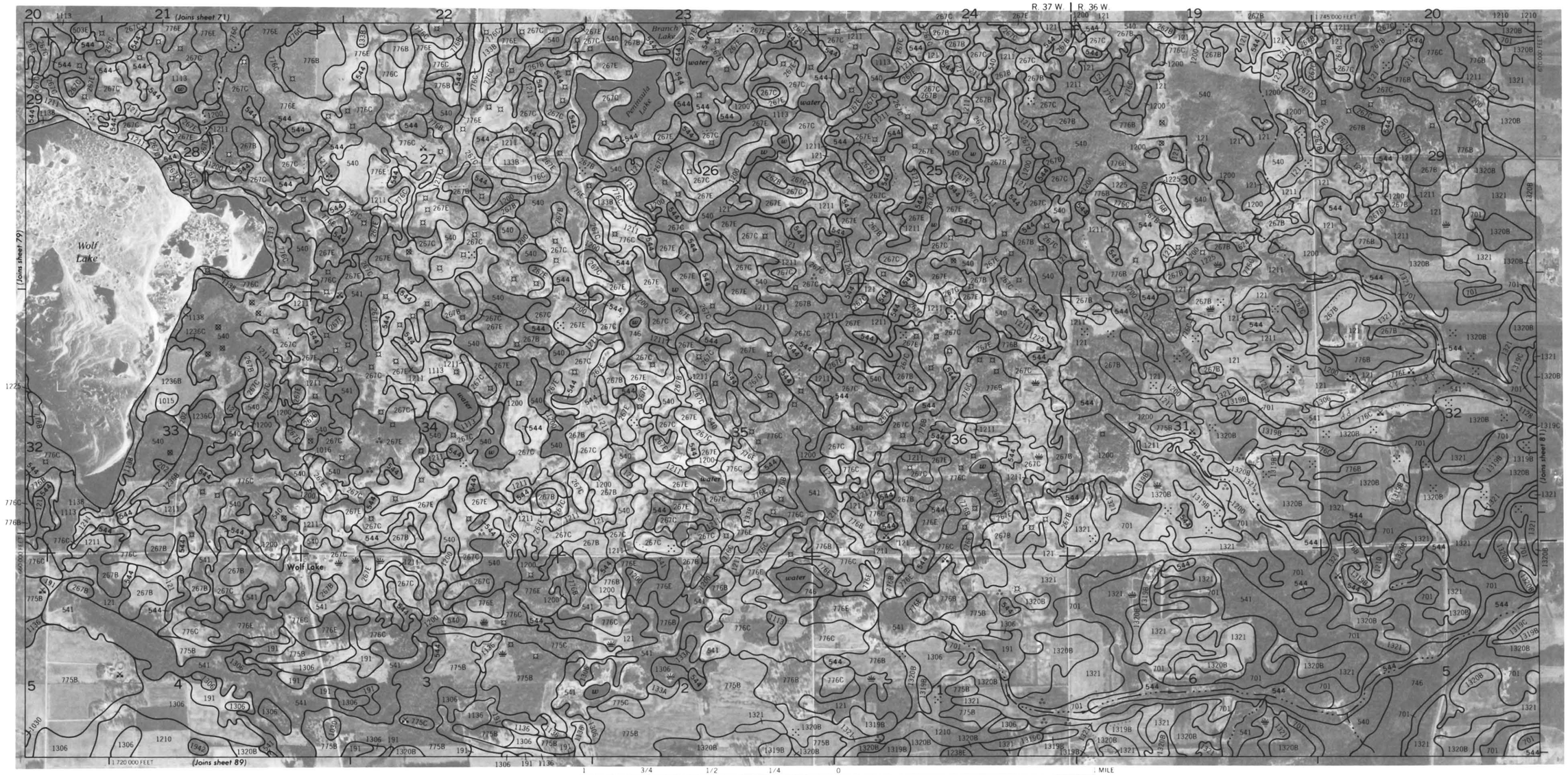
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 79

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000



BECKER COUNTY MINNESOTA NO. 80

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 81

82

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

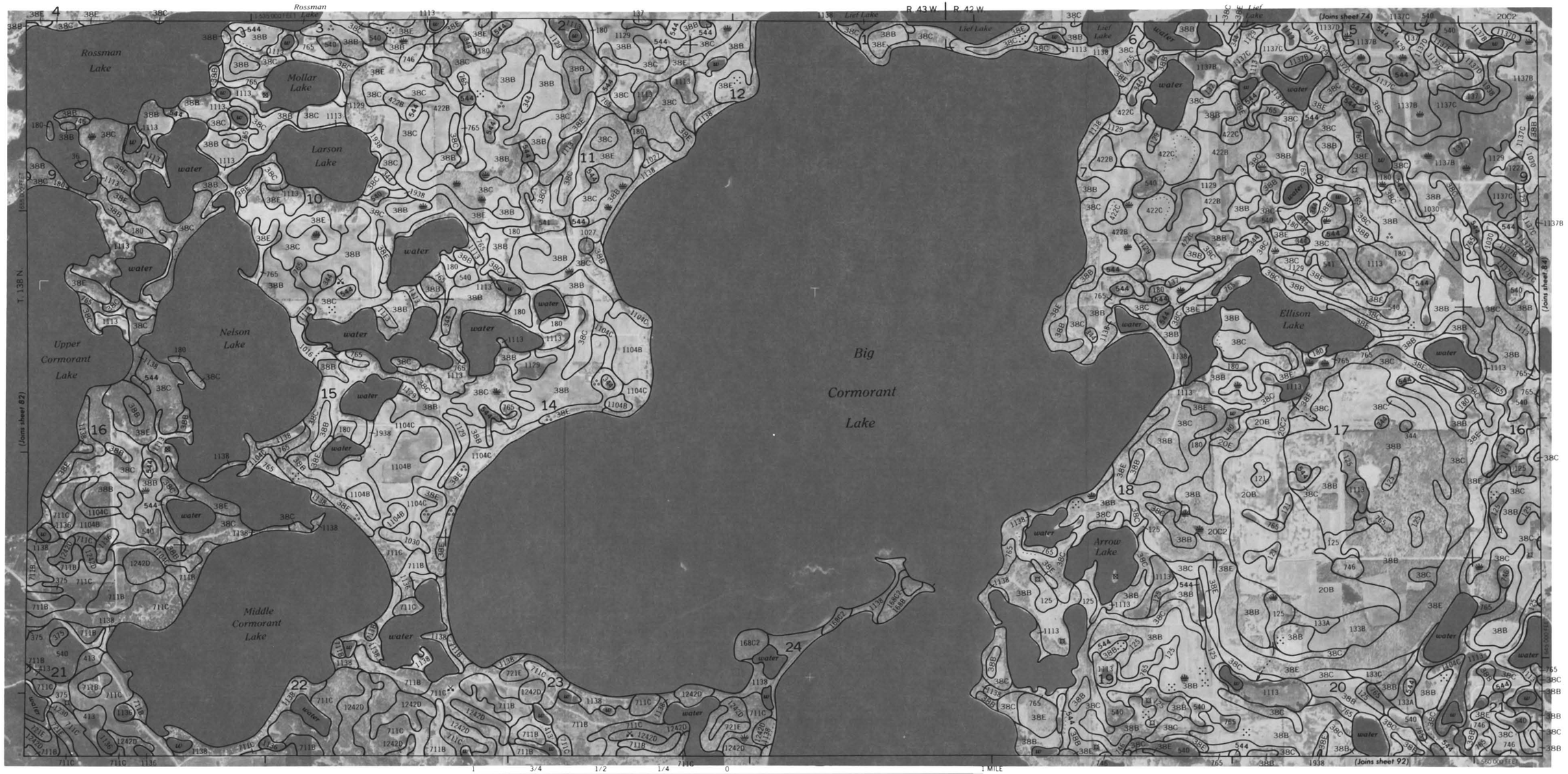
SCALE 1:20 000

BECKER COUNTY, MINNESOTA NO. 82

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 83



N

1 3/4 1/2 1/4 0 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

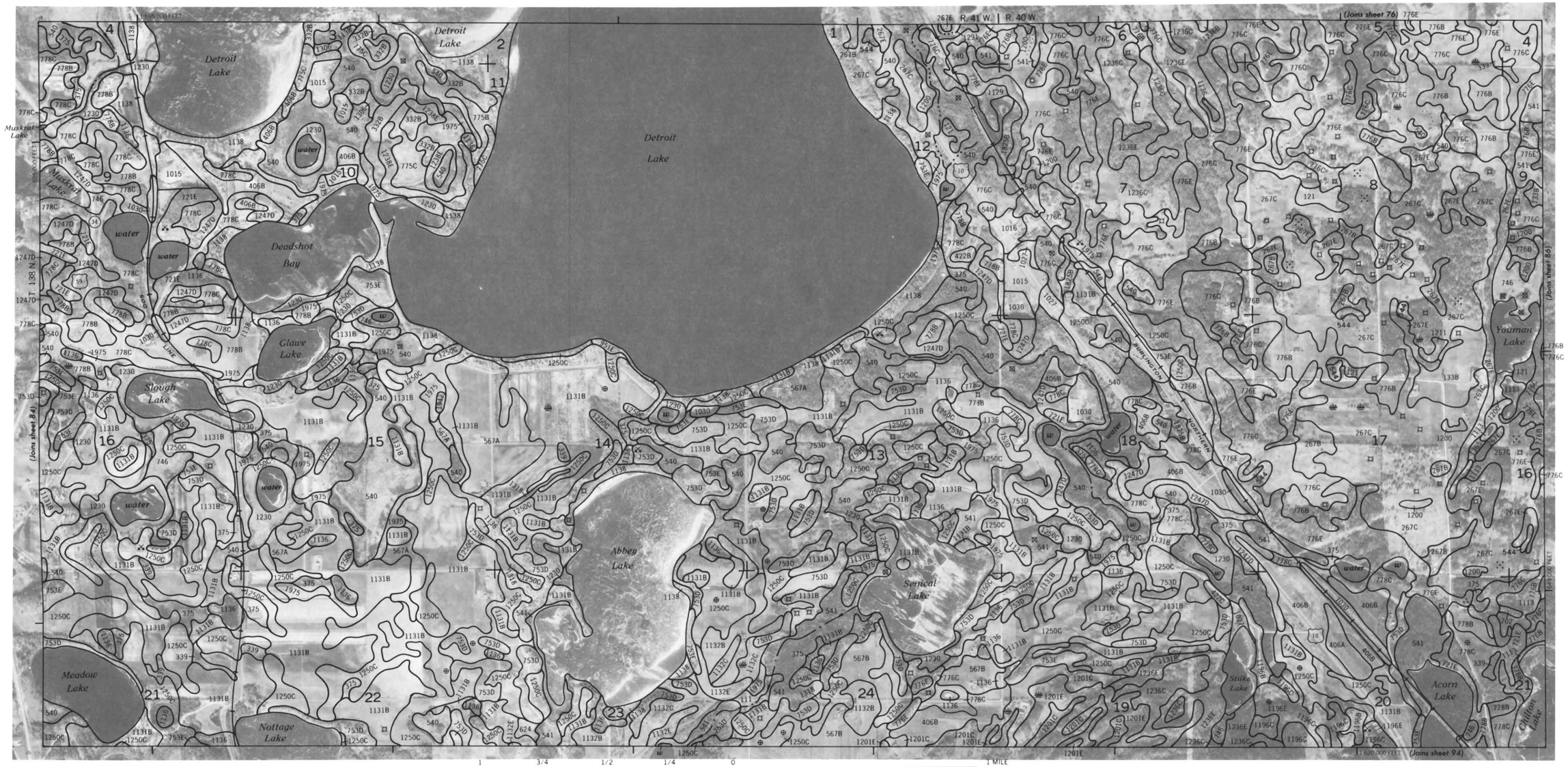
BECKER COUNTY MINNESOTA NO. 84

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

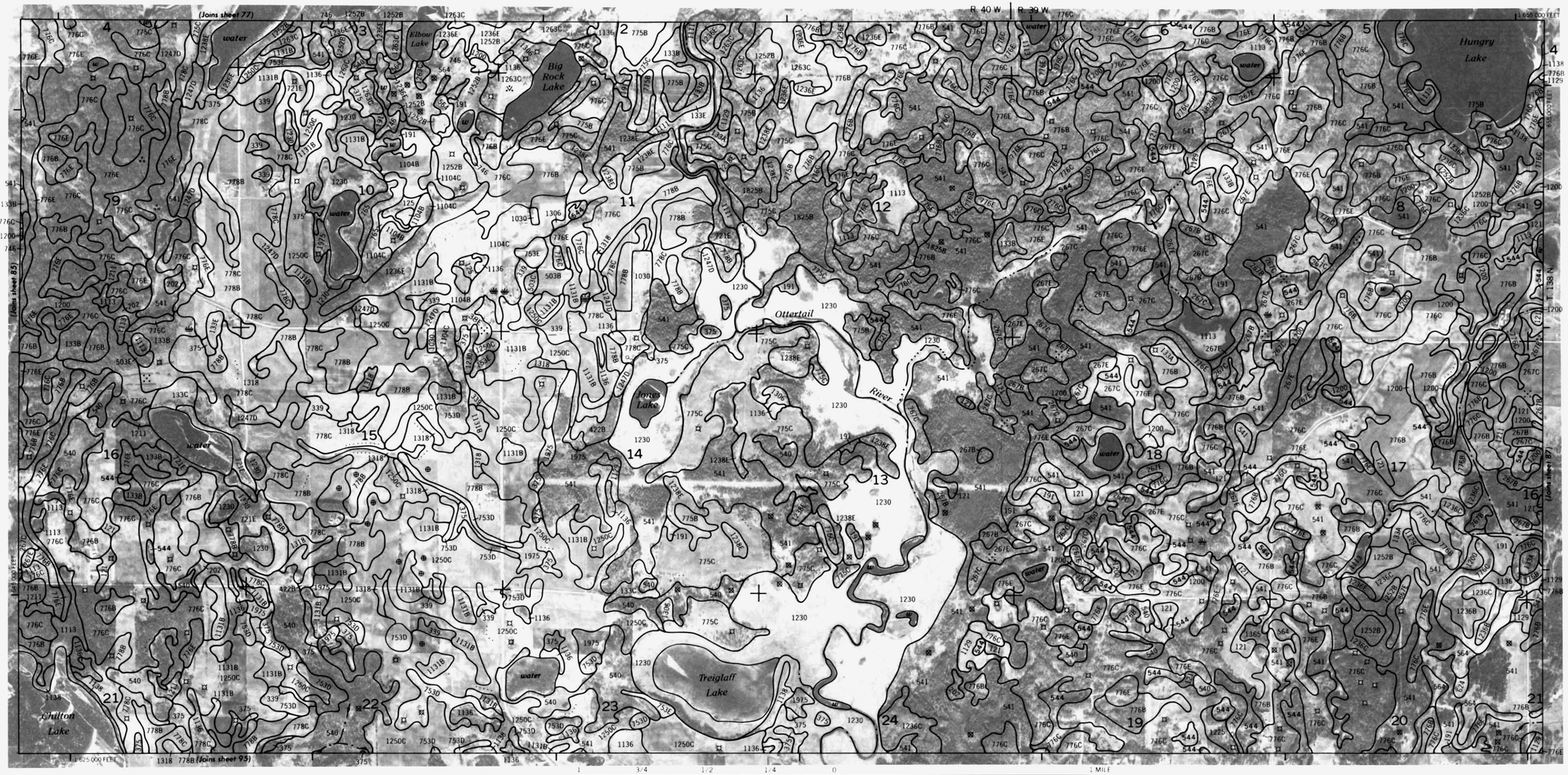
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 85



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 86

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 86

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982, 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 87

N

1 3/4 1/2 1/4 0 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

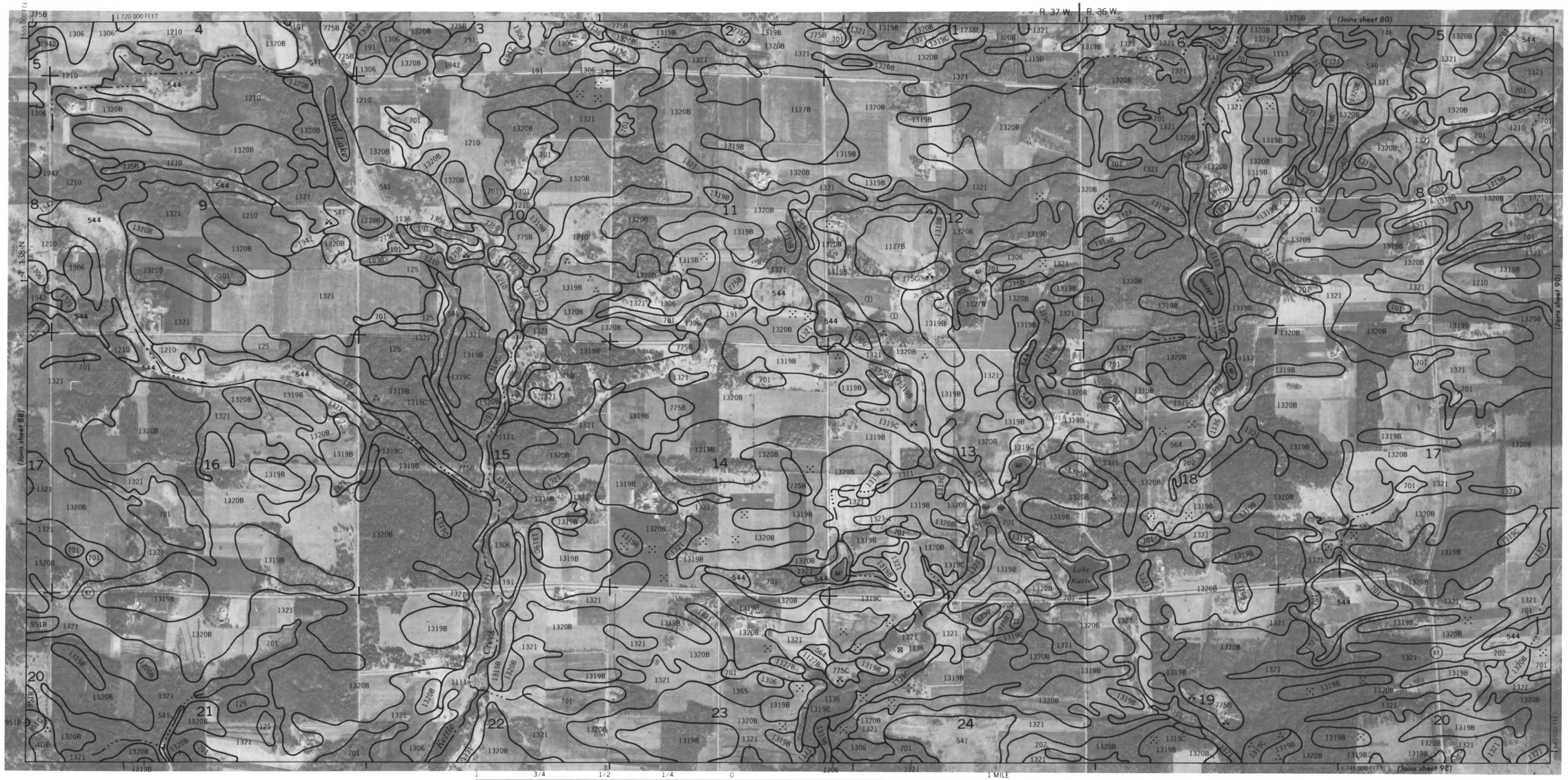
BECKER COUNTY MINNESOTA NO. 88

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 89



SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 90

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 90

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

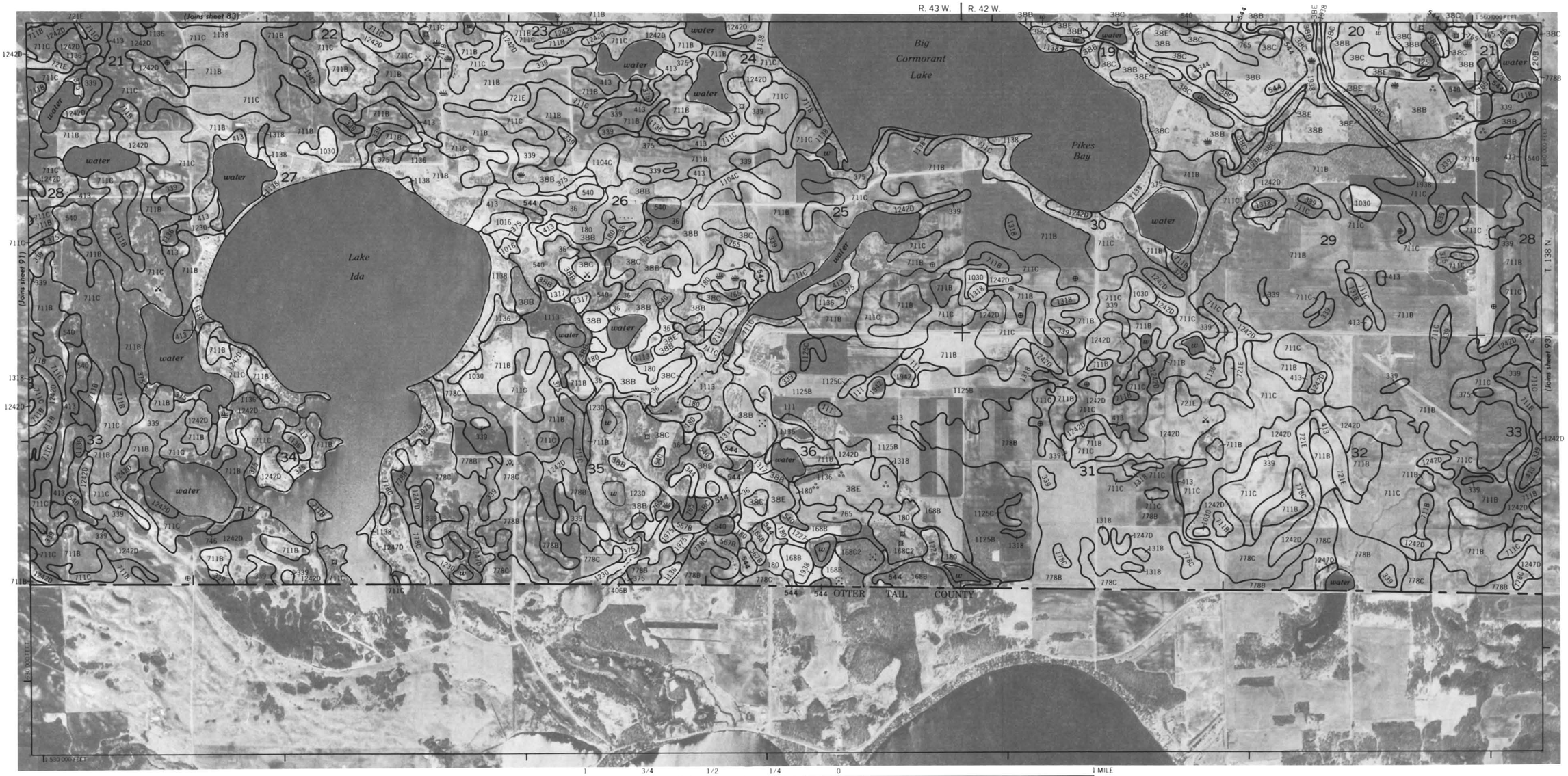
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 91

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000



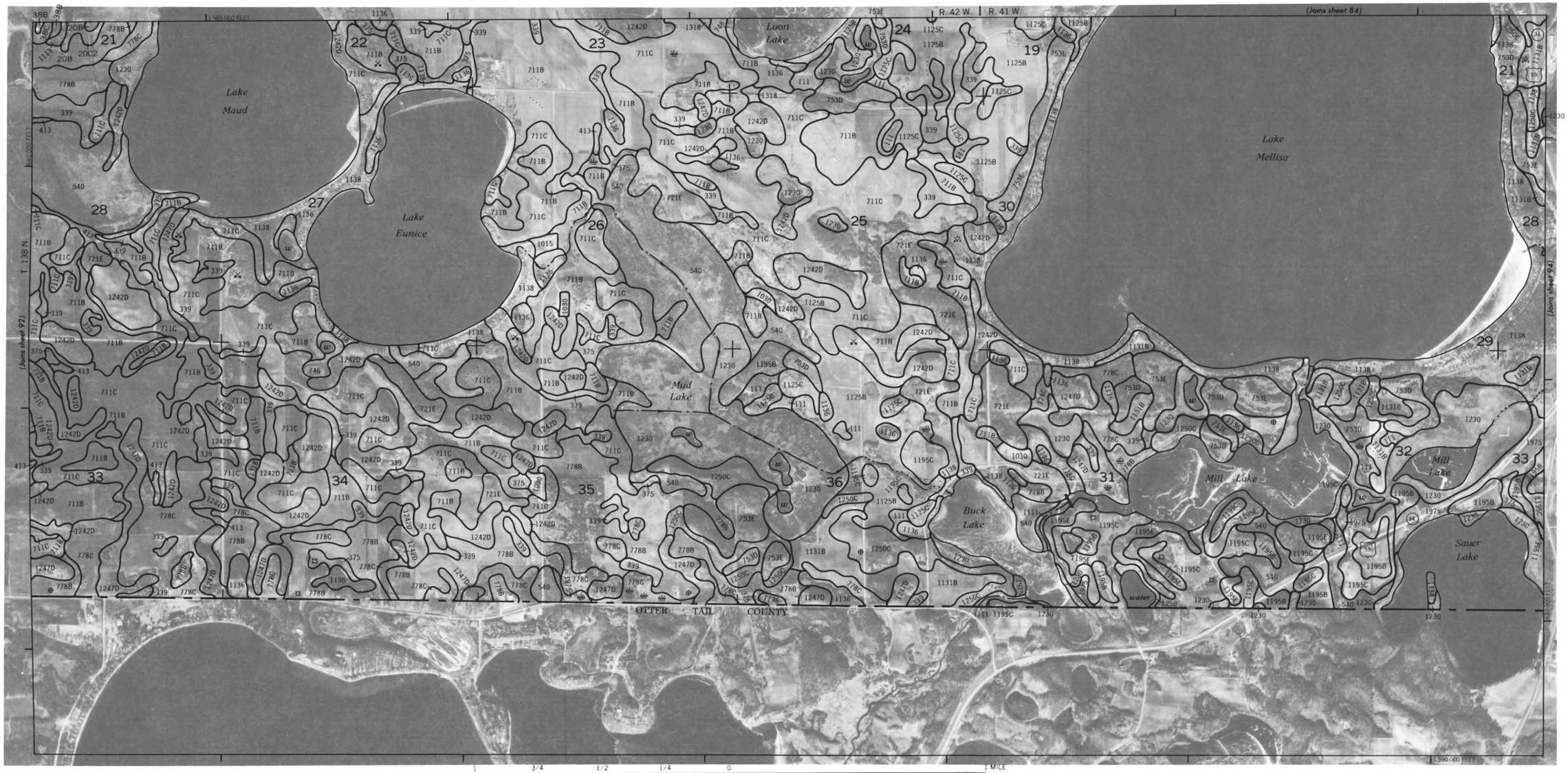
BECKER COUNTY MINNESOTA NO. 92

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 93



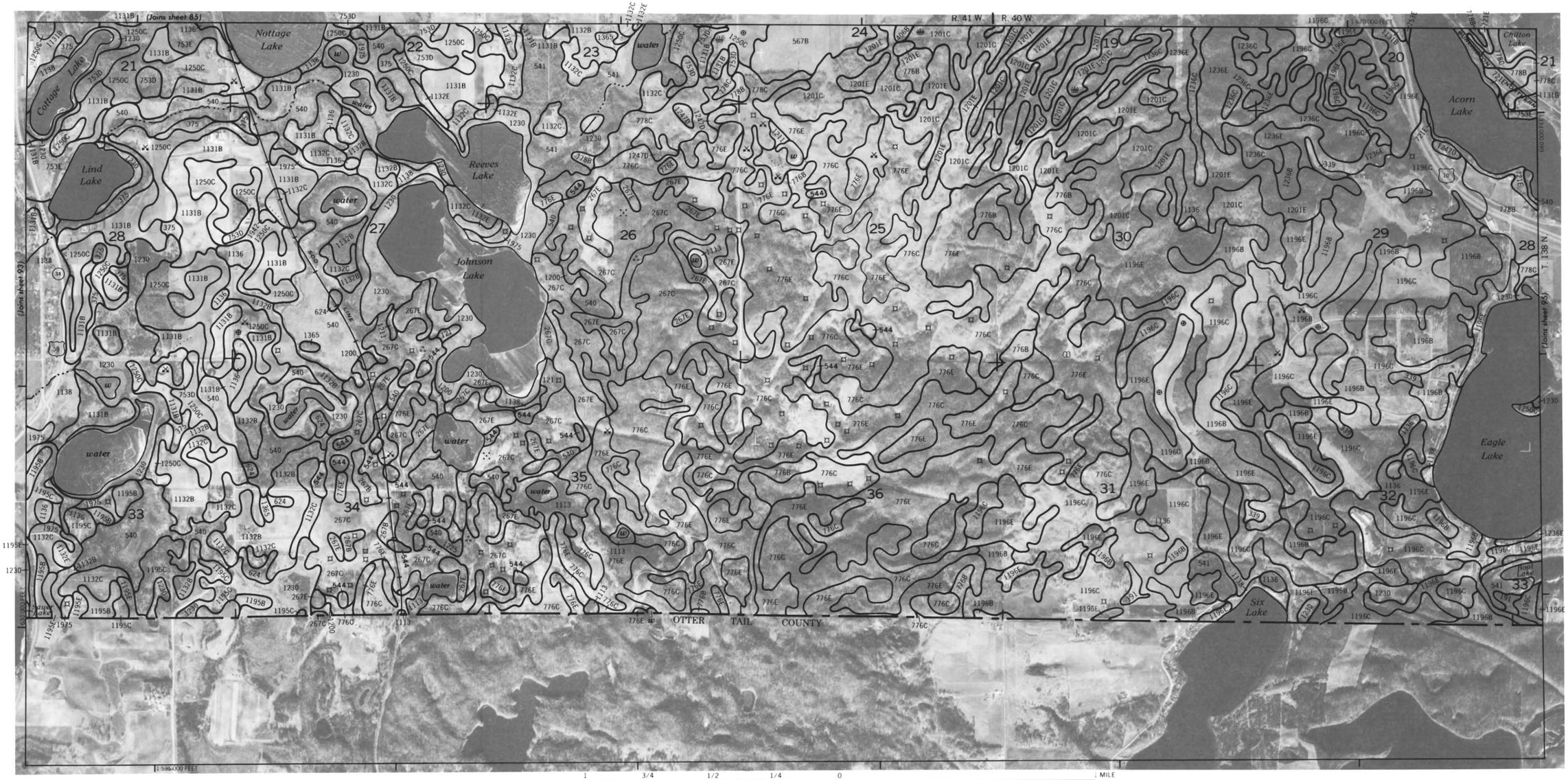
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

94

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 94

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

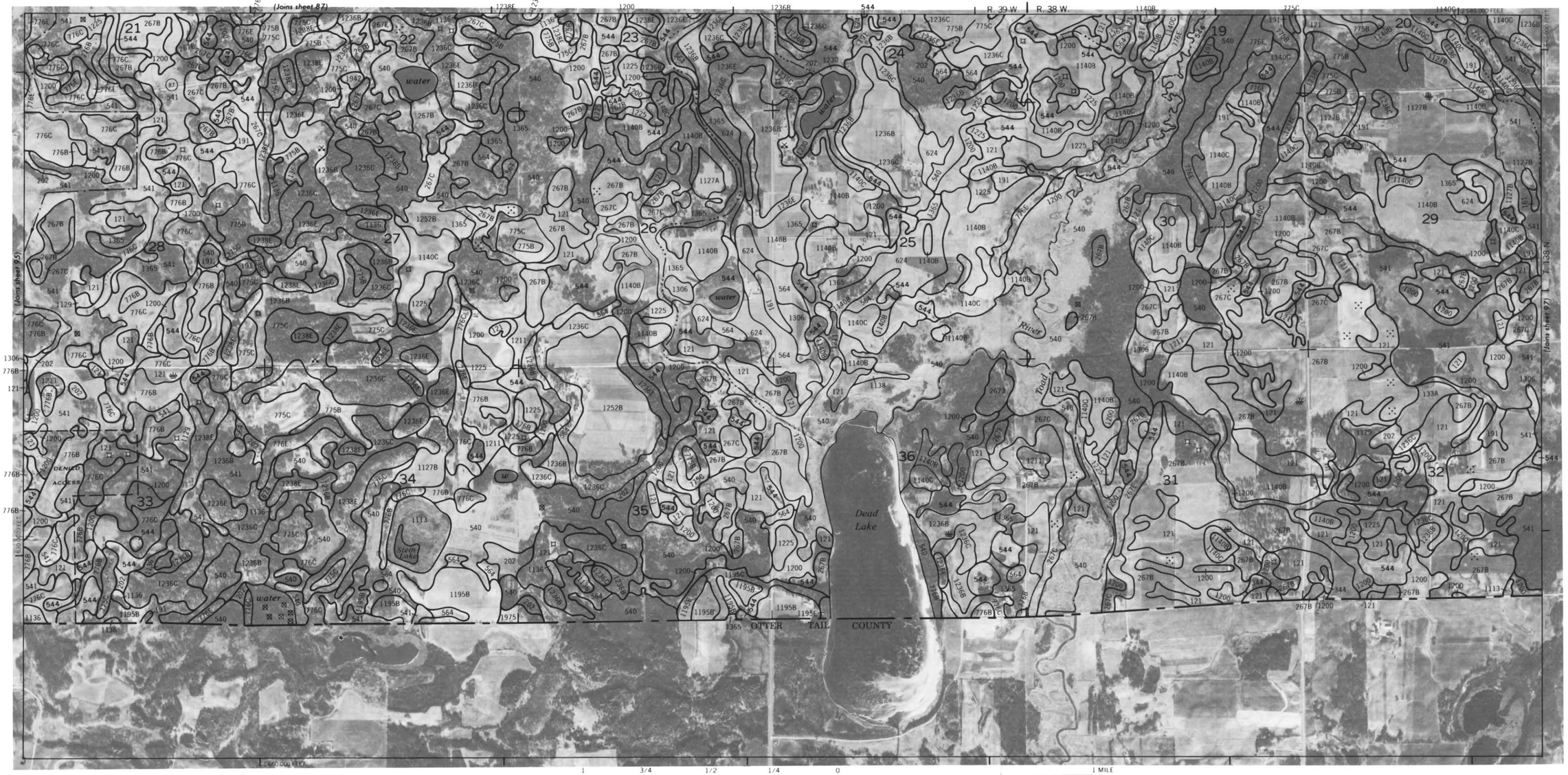
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 95

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 96

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BECKER COUNTY MINNESOTA NO. 96

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982 - 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

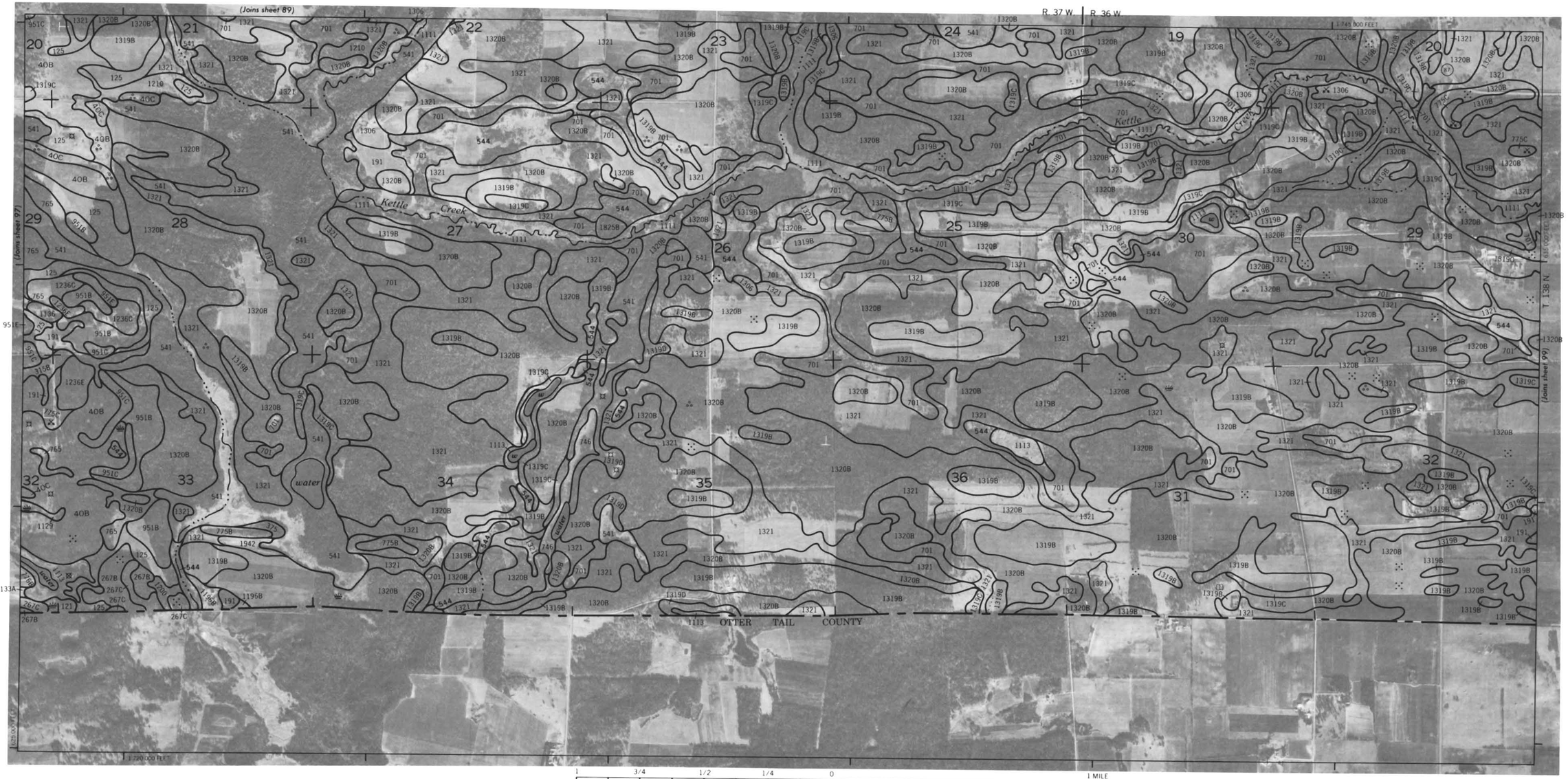
N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 97

SOIL SURVEY OF BECKER COUNTY, MINNESOTA — SHEET NUMBER 98

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

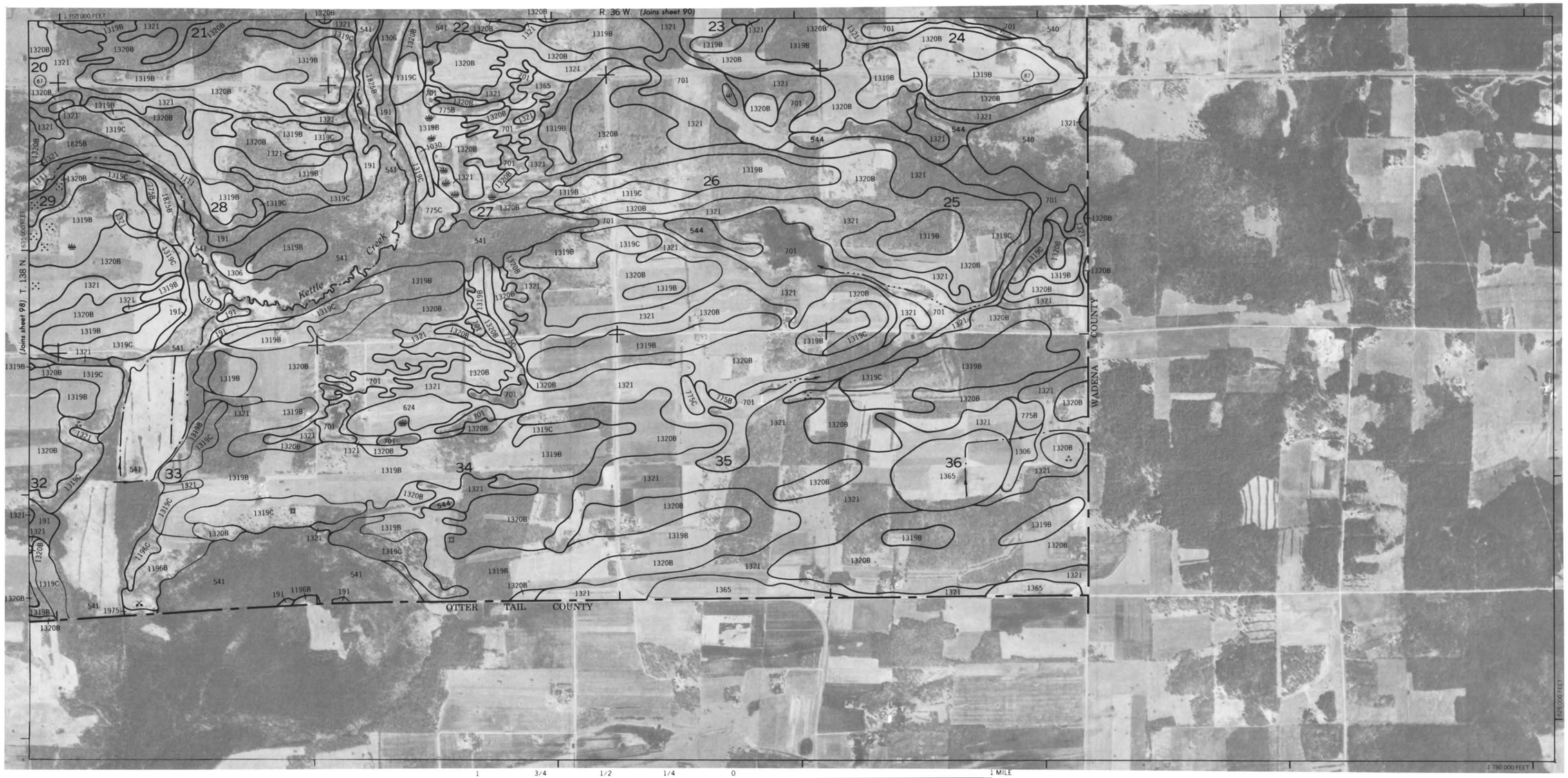
BECKER COUNTY MINNESOTA NO. 98

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1982-1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BECKER COUNTY MINNESOTA NO. 99



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000